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VOL. III.
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ENURESIS
TO
IODINE

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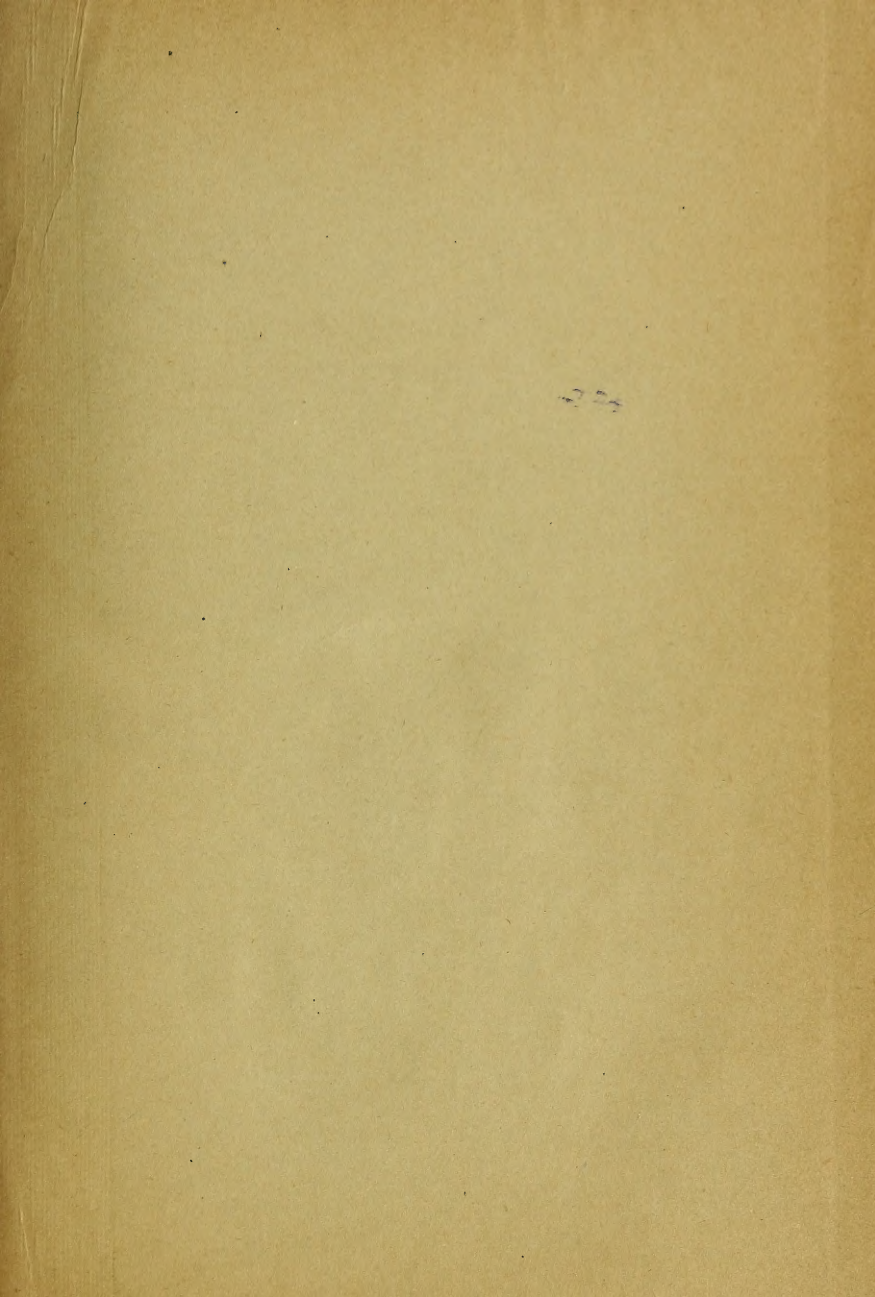
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SAJOUS'S
ANALYTICAL CYCLOPÆDIA
OF
PRACTICAL MEDICINE

BY
CHARLES E. de M. SAJOUS M.D.
AND
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ASSISTED BY
CORRESPONDING EDITORS COLLABORATORS
AND CORRESPONDENTS

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VOLUME III



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PREFACE.

IN presenting the third volume to the profession the editor wishes to state that the kind reception accorded the first two has been the source of much gratification. It has shown that the plan of the work has met the wants of the general practitioner while preserving for authors and teachers the leading advantages of the older annual. This is, of course, greatly due to the continued assistance of the members of the Associate Staff, who invariably have given the work the benefit of their best efforts.

It is with deep sorrow that the editor must record the death of his friend, Professor George H. Rohé, of Baltimore, who had been connected with the ANNUAL since 1891. To enumerate his qualities would imply that he had faults. Those who knew him well could but conclude that if we were all of his kind the world would be one where generosity and affection would reign supreme. One of Dr. Rohé's last contributions appears in this volume: a review on the subject of "Insanity," calculated to clearly define the practical aspect of the various mental disorders, not only for clinical purposes, but for the court-room. How thoroughly our departed friend has accomplished his task the reader will appreciate. It is in keeping with the sincerity of purpose that characterized him.

The plan of giving special space to subjects calculated to elucidate, by the close analysis involved, many obscure phases of pathogenesis, has been continued in this volume. The articles on "Infantile Myxœdema (Cretinism)," by Professor Osler and Dr. Norton, of Baltimore; "Exophthalmic Goitre," by Professor Putnam, of Boston; and "Goitre," by Professor Adami, of Montreal, thus form a trio which may be said to point to much of the progress that is to attend medicine in the near future. This, of course, has not in any way diminished the practical value of the work, for the third volume seems especially favored in this direction. The articles on "Fractures," by Professor Stimson and Dr. Keyes, Jr., of New York; on "Gout," by Dr. Levison, of Copenhagen; on "Hip-joint Disease," by Dr. Reginald H. Sayre, of New York; "Diarrhœal Diseases of Infants," by Professor Blackader, of Montreal; "Intubation," by Professor F. E. Waxham, of Denver, are all models of their kind, and may be mentioned as particularly valuable to the general practitioner. An analytical study of "Hysteria" and "Hypnotism," by Professor Eskridge, of Denver, also forms an especially attractive feature of this volume, which it is hoped will meet with the approval of its readers.

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SAJOUS'S ANALYTICAL CYCLOPÆDIA OF PRACTICAL MEDICINE.

E

ENURESIS.—Gr., ἐνυρπεῖν, to urinate in; from ἐν, in, and ὄυρον, urine.

Definition.—Involuntary discharge of urine; incontinence of urine.

Symptoms.—If we may speak of the symptomatology of this affection, which in itself, in the majority of instances, is to be regarded as a symptom, rather than as the actual disease, the ground is amply covered by the single statement which is usually detailed by the parent or the patient, that there is an involuntary passage of urine. Manifestations of a neurotic character are frequently found associated with enuresis.

It is not a very difficult matter to discover the presence of the trouble under consideration, but the determination of the cause or the causes for its existence is by no means so easy and is sometimes rendered impossible.

Enuresis is not liable to be mistaken for any other affection, with the single exception of the incontinence, or overflow, symptomatic of retention of urine due to prostatic enlargement or some other obstruction to the genito-urinary track, from the bladder, outward.

Etiology.—Incomplete development of the sphincter muscles, existing in the infantile period, may persist for an ab-

normal time (beyond the second year); when this occurs, it is followed by the involuntary emission of urine.

Incontinence of urine in children depends upon insufficiency of the sphincter vesicæ muscle, which allows the urine to enter into the upper part of the urethra, whence it is expelled by a reflex action of the detrusor urinæ muscle. Patients should sleep upon a bed with the foot-end raised, thoroughly empty the bladder, and take no fluids before retiring. Van Tienhoven (Wien. med. Presse, Aug. 24, '90).

Enuresis may be caused by debility of the neck of the bladder and of the internal sphincter; insufficient innervation from disease of the spinal cord and of the nerve-centres; reflex irritation; masturbation; an overdistension of the bladder with urine; changes in the constitution of the urine. Carpenter (Phila. Polyclinic, Oct., '93).

In a number of cases enuresis may be a local manifestation of a general lack of tone of the entire muscular system.

In many cases of enuresis the fact noted that the majority suffered from marked nutritive disturbances. In comparatively few cases can the disorder be attributed to reflex causes alone. Even where there are no gross evidences of malnutrition, the metabolic activity in the sensitive nerve-cell is probably disturbed. Hence, strychnia is recommended, on the whole, as the most valuable drug. A study of individual

dietetic needs is most important in every case. McKee (Phila. Polyclinic, Oct. 17, '96).

Diseases of the nervous system, both functional and organic, are recognized as factors in producing this disease.

Incontinence of urine in children is a true neurosis and not, as a rule, due to muscular incompetency of the sphincter vesicæ. It rests upon excitability of the nerve-centres produced by heredity and age; anæmia with consequent malnutrition, increasing the excitability of the nerve-centres, and reflex irritation. Rachford (Archives of Ped., Nov., '93).

Incontinence of urine inherited from father by family of five girls and one boy. The two elder children, girls, are always more affected toward the menstrual period. The incontinence affects most all of the children alike by day and night. Two of the children were subject to fits, which began during early childhood; and they showed also other signs of degeneracy. Monro (Lancet, Mar. 14, '96).

Enuresis is due to some general nerve condition, for most children suffering from it are children of neurotic parents. Other nervous disorders are frequently present. Epidemics are very frequent in institutions in which many children are brought into close contact. Thiemich (Berliner klin. Wochen., July 30, 1901).

The great frequency of enuresis and the absence of any determinable cause in most cases lead to the inference that the most frequent cause has not been ascertained, and especially that it is not a neurosis only. Barbour (Therap. Gazette, Sept. 15, 1901).

Affections of the spinal cord which lead to incontinence are rare in childhood. Enuresis frequently is found associated with epilepsy.

As to the local conditions which produce incontinence, there may be mentioned, overdistension of the bladder with urine; hyperacidity of the urine; cystitis; phimosis, or an adherent prepuce, either of the glans penis or of the clitoris; nephritis; pyelitis; vesical and

renal calculus; glycosuria; masturbation; and rectal irritation.

Of 355 boys and 176 girls, taken at random among the lower and middle classes, 21.5 per cent. were found to be incontinent, the limit of normal continence being placed at three years. Among the 77 incontinent cases, 42 were boys, 35 girls; in 47 incontinence was only nocturnal, in 2 only diurnal, and in 28 both nocturnal and diurnal. In 63 it continued from infancy; in 14 it came on after primary incontinence of infancy had ceased. Townsend (Boston Med. and Surg. Jour., Feb. 16, '88).

Forty cases of urinary incontinence among the soldiers in the military hospitals of Moscow analyzed. In the majority of these cases there existed anæsthesia of the mucous membrane of the bladder and urethra, and in some anæsthesia extended over considerable areas of the body. In 10 cases there was a history pointing to heredity. Oserezkowski (Neurol. Centralb., Apr. 1, '89).

Contraction of the bladder may cause incontinence. Case of a single woman, aged 30, in which bimanual examination revealed the fact that there was practically no bladder, it being merely represented by a small, hard lump about the size of a walnut. Mayo Robson (Brit. Gynec. Jour., Aug., '95).

In eight cases of diurnal enuresis observed by the author he found the existence of bacteriuria. The urine, obtained with all the necessary precautions, contained the coli bacillus. For the treatment the author resorts to lavage of the bladder with a solution of nitrate of silver and internal antiseptics, such as salol, but the bacteriuria resists for some time. Lyder Nicolaysen (Norsk Magazin f. Læger, p. 1012, '96).

Case in which nocturnal incontinence came on quite suddenly in a woman of forty-five. Examination disclosed in Douglas's pouch a tumor of about the size of a small egg, very hard, and increasing rapidly. The tumor, which was removed by Pozzi, proved to be an ovarian cyst. The incontinence disappeared with the removal of the tumor. Henri Picard (Jour. de Méd. de Paris, Apr. 3, '98).

Three years' observation in the State Industrial School showed that in institutions, at least, enuresis is directly due to masturbation in about 90 per cent. of all cases. Seventy-five cases of enuresis were observed in a total school population of from 800 to 900 pupils between the ages of ten and twenty-one years. Beilby (Amer. Med., Mar. 5, 1904).

Children are liable to fissure of the anus with far greater frequency than is generally believed, and this may excite involuntary urination. Constipation and the presence of worms (mostly ascarides) are among the more common causes of this disease.

Prognosis.—When the cause can be discovered and removed, the prognosis is favorable; in elderly people, however, the affection is generally due to paralysis or deep-seated disease of the urinary organs. The outlook is usually favorable in cases of enuresis nocturna. Sometimes, however, it proves to be a very obstinate malady.

Treatment.—Unless the cause be discovered and its removal effected, the treatment of this disease must then be empirical.

Atonic conditions, in children as well as in adults, often lie at the foundation of the lack of control over the passage of urine, and, in these cases, out-door exercise should be advised and a carefully-selected diet prescribed for its nutritiousness and digestibility.

Medicinally, the use of ferruginous preparations are indicated. The syrup of the iodide of iron is readily taken by children. For adults, the pepto-mangan (Gude) is an excellent tonic. The dose of the first is from 3 drops upward, well diluted with water; and of the second a dessertspoonful to a tablespoonful, in milk or wine. Jacobi speaks highly of the elixir pepsinæ, bismuthi, et strychninæ of the National Formulary, in in-

sufficient gastric digestion associated with atony of the stomach; a child of three years taking a teaspoonful three times a day.

Incontinence due to a weakness of the sphincter muscle is best relieved by ascending doses of strychnine or the tincture of nux vomica.

Case of incontinence of urine, of twenty-five years' standing, cured by the dosimetric use of strychnine. Chazaraïn (Dosimetric Med. Review, Dec., '90).

Douching of the perineum with cold water is advised, or the application of the faradic current, one electrode being placed in the rectum and the other over the perineum in the male and the mons veneris in the opposite sex. The current is to be gradually increased.

In girls the urethral electrode should be applied to the entire urethra, not entering the bladder or getting outside the meatus. The negative pole employed in the urethra and the positive not to the hypogastrium or loins, but to the thighs. Jamin (Annales des Mal. des Organes Genito-Urin., June, '89).

Enuresis in the female treated, with excellent results, by introducing metal catheter, five to seven centimetres deep, into the bladder. While the index finger of the right hand closes the end of the catheter, the left index finger is placed on that part of the catheter which is just outside of the meatus urinarius, and firm, but elastic, pressure is exercised by this finger, first downward and then to either side. In this manner the sphincter vesicæ and the muscles of the urethra are forcibly stretched. Sânger (Weekly Med. Review, June 20, '91).

Case of involuntary enuresis successfully treated by means of Morton's induced static currents, furnished by the oscillatory discharge of Leyden jars connected with an electrical machine. The patient is not insulated, but is connected with one of the jars, while the other is connected with earth. The intensity of the current is regulated by merely altering the distance between the jars. A sound, the end of which formed an elec-

trode, is introduced into the urethra as far as the sphincter of the bladder, and its free end is attached by a chain to one of the Leyden jars; the machine is regulated to give 6 to 8 sparks a second, and each sitting lasts five minutes. Capriati (Arch. d'Elect. Méd., Mar. 15, '98).

If incontinence is due to hyperæsthesia of the mucous membrane or irritability of the bladder, the remedy indicated is belladonna.

Baruch, Watson, and other observers bear testimony to the efficiency of this drug in the treatment of the nocturnal form of incontinence. Both belladonna and atropine are tolerated in much larger doses by children, in proportion to their size or age, than by adults.

In many cases a single evening dose of the extract of belladonna (gr. $\frac{1}{4}$ to $\frac{3}{4}$, to 1) or of the sulphate of atropine (gr. $\frac{1}{100}$ to $\frac{1}{75}$) answers sometimes to an unexpected degree, according to Jacobi. In most cases, however, belladonna or its alkaloid must be pushed to the extreme limit before an impression is made upon the disease.

Habit, which Tyson mentions as sometimes the cause of enuresis in children, may be corrected, as suggested by this author, by encouraging the cautious practice of holding the water.

Masturbation, phimosis, adherent prepuce, rectal affections, etc., must receive appropriate treatment, after which the incontinence of urine, if it persists, will demand attention.

Two cases of incontinence in girls cured by gradual distension of the bladder with a 4-per-cent. boric-acid solution. Both were 18 years old, and from earliest infancy had wet the bed nightly, and found it impossible to retain the urine for more than a few minutes while awake. The bladder of both was abnormally small; that of the one held 8 ounces under pressure, that of the other only $3\frac{1}{2}$ ounces. The treatment consisted

in distending the viscus until discomfort was produced, after which the patient held the fluid as long as possible: ten to fifteen minutes in the beginning, though this time was doubled later. Distension was practiced every other day, and improvement was rapid. Treatment was continued until the bladder would hold 20 ounces, and then, all symptoms having been relieved, it was discontinued. The elapsed time in one case was three months and in the other five months. Haven (Boston Med. and Surg. Jour., June 15, '99).

Incontinence of urine in young unmarried women is often due to tension on the urethra produced by adhesions between the uterus and bladder. In such cases, brilliant results will be obtained by the following operation: The anterior vaginal *cul-de-sac* is incised transversely and through this incision the bladder is separated from the uterus. The space thus obtained is packed with gauze and is gradually allowed to heal by granulation. By this means the drag on the urethra is abolished and the incontinence is cured. Cumston (Medical News, Jan. 16, 1904).

Sir Henry Thompson strongly advocates the application of nitrate of silver to the urethra, whether in the male or the female. He states that the use of a flexible bougie, small, of course, for children, passed daily, and removed in a minute or so, is sometimes successful.

If this fails, the injection by means of a sufficiently long tube of the nitrate-of-silver solution to the prostatic portion of the urethra and neck of the bladder is a remedy of no mean value. For young women up to the age of 18 or 20 in whom this malady still exists, Thompson has found this treatment almost invariably successful. It should be applied immediately after the bladder is emptied, in quantity, say of a drachm, and of a minimum strength of 10 grains to the ounce, up to treble that strength if necessary for subsequent application. Enough should be employed to produce smarting,

which should continue for a day or so. A week or two should elapse between each application.

Some authors advise blistering the perineum, others the use of the actual cautery, touching the same at several points around the anus. J. William White and Edward Martin state that when a habit of nocturnal incontinence is due originally to carelessness—the child, though awakened by the desire to urinate, prefers to wet the bed to getting up—that such cases may be cured by having the patient waked at about one or two in the morning, or at an hour before the habitual time of involuntary micturition, and made to empty the bladder.

New surgical treatment of incontinence of urine in the female. New operation: An incision is made along each side of the meatus and prolonged for more than an inch into the vagina. Then a strip of mucous membrane half an inch wide is resected from the outer side of each of these incisions. The urethro-vulvo-vaginal band is divided and the part of the hymen or its remains, corresponding to the operative field, is resected. The lateral wounds are then sutured separately and a strip of gauze is inserted between them to prevent any possible adhesions between the right and left suture-lines, and the vagina is filled with gauze. The patient is catheterized for twenty-four hours to avoid contamination of the wound, and is kept in bed three days. The tampons should be inserted daily for three or four weeks and the cicatrization carefully watched during this period. The results are said to be most satisfactory. Flouquet (*Jour. des Sci. Méd. de Lille*, May 20, '99).

Among other remedies employed in this affection are antipyrine, *rhus toxicodendron*, potassium bromide, monobromide of camphor, and ergot.

Antipyrine recommended in incontinence of children. Out of 37 cases, 19 were completely cured, 15 much relieved, and in but 3 was there total failure; 7 to 15 grains to be given in the evening

after 8 P.M., or so that the last dose be administered after this time. The drug is usually well borne by children. Gunde (Lancet, Aug. 8, '91).

Fluid extract of *rhus aromatica*, 2 to 15 drops three times a day, used with good results in incontinence of urine in children. If the urine is acid and high colored, it is well to begin the treatment by giving an alkaline mixture, as

R Potassium citrate, 2 drachms.

Spirit of nitrous ether, 4 fluid-drachms.

Simple syrup, 1 fluidounce.

Water, sufficient to make 3 fluid-ounces.

A teaspoonful in water every two or three hours. H. B. Carpenter (Phila. Polyclinic, Sept. 5, '96).

Report of efficacy of liquid extract of *rhus aromatica*, based upon the results obtained in 30 cases, in which a sufficiently-long time had elapsed since their discharge (nine months to two years). Those which had already been treated with belladonna, strychnine, or tonics generally, but without apparent success, were at once put on *rhus aromatica*, whereas the others who had not been treated for enuresis before had to undergo a preparatory treatment. This consisted in regulation of diet, sleeping on a hard mattress, the use of light coverings, and cold sponging along the spine. The parents were directed to take their children up once or twice during the night, and to make them pass water.

The dose employed was:—

5 to 10 minims for children 2 to 5 years old.

10 to 15 minims for children 5 to 10 years old.

15 to 20 minims for older children.

A very convenient formula being:—

R Ext. *rhus aromatica* liq., 10 minims.

Syrup. *aromatici*, 20 minims.

Aq. *destillata*, ad 1 drachm.

Sig.: Three times a day.

Thirty-three days on an average were sufficient to produce a permanent cure; 53 days to effect a permanent improvement.

Eleven boys and 7 girls were permanently cured; 1 boy and 9 girls were permanently relieved; in 2 girls no

improvement could be achieved. A relapse occurred in 3 girls after an interval of some months. A temporary exacerbation of the enuresis was noted in 8 cases; 3 boys and 5 girls; it occurred during or toward the end of the first week in 5 cases and during the second week in 3 cases. Ludwig Freyberger (Treatment, May 12, '98).

The child should sleep with the head lower than the pelvis, thus creating a mechanical obstacle to the passage of the urine, which no longer irritates the urethral sphincter. Twelve children and an adult treated successfully by this method. Strumpf (Lyon Méd., Nov. 26, '99).

In four cases of incontinence of the bladder, due to various causes (tuberculosis of the bladder, paraplegia with cystitis, and relaxation of the sphincter in old women), after the epidural injection of $\frac{1}{8}$ grain of cocaine the contractile power of the sphincter returned in one or two days. It remained for a long time, but in some cases only after repeated injections. Albarran and Cathelin (Soc. de Biologie, July 13, 1901; Centralb. f. Chir., No. 48, 1901).

In eight cases of incontinence of urine epidural injections gave good results; these were cases of nocturnal infantile incontinence with diurnal pollakiuria. Four were promptly cured and have had no trouble for several months. In the other cases the diurnal pollakiuria disappeared promptly and the nocturnal trouble has become less frequent. These results were particularly gratifying, because all these cases had proven refractory to the medical treatment usual in the treatment of enuresis. In the introduction of the serum or the cocaine the sacral route was utilized. M. Louveau (La Méd. Mod., Nov. 12, 1902).

Where abnormally frequent urinations are due to disturbances in the bladder innervation, Fernand Cathelin, of Paris, devised the operation of epidural injections and obtained good results. Eight cases treated by the writers by this method at the Manhattan Hospital West for the insane were all adult women and had histories of wetting the bed and clothing frequently

for some time previously. The injections are made into the sacral canal between the periosteum of the vertebræ and the dura mater. The canal is reached through its opening in the sacrum. The patient is placed in the Sims position, the area sterilized, and the small osseous tubercles just below and to either side of the last palpable sacral spinous process are made out. The needle of an aspiration syringe is then thrust through the skin, drawn tightly between these two tubercles, the needle being held at an angle of 40 degrees to the sacral curve until it passes through the membrane covering the opening of the canal, when it is lowered to 20 degrees and pushed on into the canal. Five centimetres of sterile salt solution were usually injected at first and later ten or even fifteen. These injections were made at intervals of about one week and favorable results followed immediately in all eight cases upon whom the injections were made. These cases have not been followed very long, but most promising results have thus far been obtained. The injections seem to be in nowise dangerous to the patient, and are no more painful than any hypodermic injection. The immediate effects are rarely even disagreeable. The rationale of the treatment is not fully explained and is probably not wholly understood. F. C. Valentine and T. M. Townsend (Medical Record, Sept. 26, 1903).

With ergot I have had personal and very favorable experience. Normal liquid ergot was employed, in doses of 20 drops to 2 fluidrachms, in water thrice daily.

Case of paralytic incontinence of urine in which the patient wore a portable rubber urinal for ten years. This proved unsatisfactory, and he discarded it in favor of an ordinary carpenter's screw-nail ($1\frac{1}{2}$ inches in length), which he screwed into the orifice of the prepuce, the latter being quite insensitive. This contracted to a small opening, which, throughout its entire length ($\frac{3}{8}$ inch), bears a thread corresponding exactly to the thread of the screw; so that it only

admits the latter when properly started. An ivory screw was made to replace the steel one. Otto Kiliani (Ann. of Surg., May, '99).

Collodion in nocturnal enuresis applied over the opening of the urethra is an effective measure; the pressure of the urine awakens the child, and it thus becomes gradually weaned from the habit of bed-wetting. Somways (Brit. Med. Jour., No. 9, 1900).

Case in which Gersuny's method of injections of paraffin in incontinence of urine caused paraffin embolus into the lung, with consolidation. The possibility of lung-embolism and also of cerebral embolism. J. Pfannenstiel (Centralb. f. Gynäk., Jan. 12, 1901).

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EPIDEMIC CATARRHAL FEVER.

See INFLUENZA.

EPIDIDYMITIS. See PENIS AND TESTICLES, DISEASES OF.

EPILEPSY.—From *ἐπιλαμβάνειν*, to fall upon or seize.

Synonyms.—*Morbus sacer*; falling sickness.

Definition.—Epilepsy may be defined as a disease characterized by the habit of having convulsions, attended usually with unconsciousness, the seizures occurring suddenly and at irregular intervals, the subject showing an essential tendency to progressive mental and motor weakness.

Varieties.—The generic term epilepsy is applicable to and includes numerous subtypes, some of which differ from each other symptomatically and otherwise most markedly; hence the necessity for a classification of varieties. We have, for example, a division into two forms expressive of a difference in the degree and intensity of the motor spasm and impair-

ment of consciousness in the attack—major and minor epilepsy, or, as the French express it, *grand* and *petit mal*. Other synonyms are general and partial, and, in a more restricted sense, frank or masked epilepsy. In *grand mal* both consciousness and motor spasm are involved in profound degrees. In *petit mal* both consciousness and motor spasm may be only slightly and transiently involved. In *general* epilepsy the motor spasm may involve all the muscles of the body and the loss of consciousness may be absolute. In *partial* epilepsy only one extremity or even one set of muscles may be affected and consciousness only slightly if at all perceptibly impaired.

The distinction between partial (Jacksonian) and true epilepsy is not a sharp one. The partial may end in general convulsions, with loss of consciousness; on the other hand, chronic convulsions in true epilepsy may occasionally be limited to a certain part of the body, and not be with unconsciousness. H. Higier (Neurol. Centralb., No. 4, '97).

Partial epilepsy is, perhaps, more readily recognizable under the name *Jacksonian*, or cortical, epilepsy: terms more popular, since they embody facts of etiological and pathogenic, as well as symptomatic, significance. The term "cortical" is, however, utterly indefensible here, since we have good reason to believe that all epilepsies are essentially of cortical origin. In masked epilepsy there may be neither motor spasm nor apparent unconsciousness, but certain phenomena of abrupt onset in the psychical or motor volitional sphere may occur which, by reason of their habitual recurrence in the same or similar form, constitute a variety of the disease; automatic, causeless, but apparently purposive movements may represent the entire motor explosion. A transient stupidity or absence of mind—per-

haps a random or irrelevant remark—may be the only evidence of impaired consciousness. Certain vasomotor disturbances, such as pallor, flushing, etc., usually accompany attacks of this character. In certain cases, first described by Weiss and to which he gave the name “psychical” epileptics, the explosion is, objectively at least, entirely in the direction of disturbed mental equilibrium, such patients being subject to irregularly and abruptly recurring paroxysms of transient insanity, usually with an aura, or warning, and with no recollection subsequently of the attacks. Such seizures, as well as other less marked, but irregularly recurring psychical disturbances, are described by other writers as epileptic psychical equivalents.

The element of periodicity in the time of occurrence of the attack, a factor of some importance in both prognosis and treatment, has served as the basis for a chronological division into diurnal, or day, and nocturnal, or night, epilepsy, the former being still further divisible into the matutinal, or morning, and the vesperal, or evening, cases. In the succeeding paragraphs upon symptoms we shall find evidence of the necessity for a further elaboration of subtypes.

Symptoms.—The symptom-picture in epilepsy varies quite widely, as has been intimated in the classification and description of subtypes. Not only is there a marked difference symptomatically in these clinical subvarieties, but each individual patient may differ in some major or minor particular from all others, although preserving in each instance some essential factor revealing a common identity. In typical grand mal the patient, with or without an aura, or warning, is suddenly seized with a convulsion, attended with unconsciousness of greater or less degree. There is simul-

taneously a sudden alteration in color, either lividity or pallor, and the unconsciousness may be preceded or attended by an involuntary cry or scream. The patient falls unconscious regardless of surroundings, the muscles of the face and extremities become extended in rigid tonic, followed quickly by clonic spasm; frothy saliva, sometimes mixed with blood, escapes from the mouth; breathing becomes labored or stertorous from spasm of the respiratory muscles; the sphincters relax, allowing involuntary escape of urine, fæces, and sometimes semen; the whole convulsive attack lasting from a few seconds to ten minutes or longer. This convulsion is followed, in typical cases, by a deep semicomatose sleep, lasting from a few minutes to several hours, the patient on awakening remembering nothing or very little of anything which occurred subsequent to the beginning of the convulsion.

Immediately after spasm the pulse-curve is dirotic or polycrotic, with rounding of the apex, or even with a flattened apex. Experiments made on healthy subjects showed that after violent muscular efforts of the arms the same modifications of the pulse-curve are present. This tends to show that modifications of the curve are due simply to muscular effort, and that sphygmographic study will prove of no assistance in distinguishing between true and false (imitated) epileptic spasms. Féré (*Nouv. Icon. de la Salpêtrière*, May, June, '88).

In a fully-developed, artificial, cortical epileptic attack, during the stage of tonic convulsion the cardiac action is slower and the arterial tension greater, while in the chronic period the heart acts more rapidly. François-Franck (*La Semaine Méd.*, Aug. 6, '88).

A calorimetric examination and an enumeration of the globules of the blood of epileptics have shown that the number of red globules increases, while that of oxyhæmoglobin diminishes with an attack of epilepsy, and these red glob-

ules assume, examined in serum immediately after paroxysm, a spherical form, while at the same time their diameter diminishes. Féré (Le Progrès Méd., Mar. 23, '89).

In 50 per cent. of persons affected with epilepsy there is some albumin present in the urine when the paroxysm is over, the increase of it bearing a proportion to the severity, and being largest in cases where the cutaneous cyanosis and congestion have been most demonstrated. J. Voisin and A. Péron (Archives de Neurol., May, '92).

The gastric juice after the attack, when injected into guinea-pigs, causes disturbance: not produced by normal gastric juice. This toxic power is slightly increased before the attack and immediately after, and varies according to the duration and intensity of the fit. Agostini (Gaz. degli Osped., No. 38, '96).

In true epilepsy, after a convulsive attack, modifications in the urine invariably found. The nitrogen and phosphates, both alkaline and earthy, but especially the latter, are increased. The toxicity of the urine is diminished.

Perturbations of the general temperature noticed, which is lowered during the convulsive period, the period of stertor, and the subsequent period of sleep. On the patient's awaking it rapidly regains, or even surpasses, the normal. The temperature is occasionally, however, raised, not lowered, during the periods of convulsions, stertor, and sleep. The hypotoxicity of the urine persists between the attacks, even when they are suspended for a year or more. Mairet and Vires (Bull. de l'Acad. de Méd., p. 99, Jan. 26, '97).

It is not uncommon to see subcutaneous facial hæmorrhage in epilepsy when the patient has been in the *status epilepticus*, or has had many seizures in the course of the day. Pierce Clark (Med. Record, Mar. 26, '98).

Special study, in 306 cases of epilepsy, of the premonitory symptoms, the seizures and the relations between them and to the intensity of the attack; also the relations between the bladder symptoms and biting of the tongue to other symptoms observed, as well as

other details which are set forth in this article of fifty pages in length. Only 14 per cent. were weak-minded. The seizures displayed a regularly ascending type in 61 per cent., an intermittent type in 26 per cent., and a descending type in 13 per cent. In 6 cases certain post-epileptic symptoms were observed which have been previously regarded as premonitory phenomena. In 1 per cent. the epilepsy was reflex, from adenoid vegetations, and from masturbation in the same proportion. Syphilis was certain in only 1 of the 26 patients of over thirty years, and hereditary lues in none. Alcoholic parents were noted in 14 per cent., and 8 per cent. of all were addicted to the abuse of alcohol. Aura were noticed in 28 per cent. They usually preceded the milder seizures. M. Biro (Deutsche Zeit. f. Nervenhe., xxiii, 1 and 2; Jour. Amer. Med. Assoc., April 25, 1903).

In atypical cases any one or several of these symptoms may be absent or so slight as to be scarcely noticeable. In some patients one or more of these symptoms may be replaced by substitutive conditions entirely different. In grand mal the post-convulsive somnolence may be replaced by an outburst of excitement or delirium or by states of altered personal identity in line with the theory of dual consciousness, during which actions both embarrassing and reprehensible may be committed, involving sometimes grave questions of medico-legal responsibility.

In *petit mal* both motor spasm and unconsciousness are involved in far less degree, as the term indicates. Very often, indeed, the disturbance is of one sphere alone apparently, the attack consisting of a transient loss of consciousness alone, without motor spasm, or of motor spasm unattended with perceptible loss of consciousness.

Not only may the motor spasm occur alone; it may be further limited to one limb or to one set of muscles, or even to

a single muscle. Such limited spasms are, however, observed—we have reason to believe—only in the organic epilepsies belonging to the Jacksonian, or so-called cortical, group. In such cases the limb or muscle involved points with localizing significance to the site of the disease-process in the corresponding centre in the cortex. This statement is true, though of less value, as regards the various forms of sensory and psychical epilepsy. Among the rare clinical forms of atypical epilepsy most of which are of the petit-mal group are *epilepsia procursiva*, *E. nutans*, *E. loquax*, cardiac epilepsy, and migrainous epilepsy. *Epilepsia procursiva* is a form of the disease in which “the attacks consist in a straight or circling run, of a variable distance, which is rarely followed by a fall or course, but by facial congestion” (Hare). The patient may run to the left or right or straight ahead. The act is essentially involuntary, of course, though absolute unconsciousness may not occur. This purposeless run may constitute the entire clinical phenomenon: it may represent the first stage of an ordinary epileptic attack; it may occur as a post-epileptic phenomenon.

Procursive epilepsy is peculiar to childhood and youth. It may be present many years before merging into ordinary epilepsy. It is impossible to localize the disease anatomically, but it is not warrantable to assume that a cerebral lesion is the organic cause. It appears to develop especially in persons with marked cerebral lesion, but it is nevertheless probable that it, like all other epilepsies, may occur without demonstrable alteration in the nerve-centres. It is often complicated with moral insanity. *Ladame* (*Inter. klin. Rund.*, Feb. 3, '89).

In *epilepsia nutans*, a minor form of Jacksonian epilepsy, the motor spasm is limited to the muscles of the neck, caus-

ing nodding of the head alone. In *epilepsia loquax* the attack consists in an explosion of speech, the focus of disease being presumably limited to the speech-centre. In cardiac epilepsy the attacks at first may resemble closely either *angina pectoris* or simple cardiac syncope. The patient has little more than an aura of præcordial anxiety, usually at night, or when lying down with transient consciousness, but without motor spasm. There is in such cases either a bradycardia or a tachycardia, rarely a normal pulse, usually no organic cardiac disease, but often some arteriosclerosis.

It is at first a petit mal. Gradually, as a rule, the attacks become more severe, and finally may assume the major, or grand mal, type. This fact of transition in these milder forms to the severer forms of the disease is true of all cases as a possibility, although in many patients a petit mal remains such.

Migrainous epilepsy is a form of the disease in which habitual migraine may be either succeeded by true epilepsy of major or minor type or the epilepsy be succeeded by migraine, or the two conditions may alternate in the same patient. In some instances many phenomena of both diseases—if they be really two—may be noted simultaneously. I have seen two such instances.

The frequent co-existence of epilepsy and migraine emphasized. Usually the epilepsy appears later than the migraine. One of the conditions, however, cannot be mistaken for the other. In instances where such a condition might have been possible it was seen that the migraine was a symptom only of the underlying epilepsy or the epilepsy appeared as a new element in addition to the migraine. It is not always easy to decide in atypical cases whether epilepsy or migraine is the main pathological condition. A neuropathic predisposition is always present in these cases, and frequently

secondary etiological elements are present,—syphilis, alcohol, and other intoxications, injuries, arteriosclerosis, and excessive physical or mental efforts. Wilhelm Strohmayer (Münchener med. Wochen., March 10, 1903).

In studying the peculiarities of attacks in individual examples of the disease it will be found of advantage to systematize such study under four divisions or stages: the preparoxysmal, the paroxysmal, the post-paroxysmal, and the intraproxysmal or interavalling period, as it is sometimes called. The preparoxysmal, or pre-epileptic, stage covers the period immediately preceding the attack. By far the most important symptom to be investigated here is the aura, or warning, by which is meant some peculiar and constant subjective sensation or psychical impression realized by the patient as being premonitory of a fit. An aura is present in less than one-half of all cases, but it may be of great value and should always be carefully investigated. The aura may be referable to any of the senses. Flashes of light, sudden blindness, weird and fantastic visions, strange noises, tinnitus, deafness, numbness or tingling or burning or pain in the extremities, disagreeable and indefinite; but constant stomachic sensations—as fullness, oppression, or pain, constriction of the throat or of a limb or of some part of the trunk—are among the auræ which have been noted.

The psychoses of epilepsy have very definite and immediate associations with other manifestations of the disease. The plea of irresponsibility for criminal acts alleged to have been committed while an individual was suffering from epileptic mental alienation should be considered invalid, unless other and irrefragable manifestations of the disease can be adduced. The vague and ill-defined convulsions, which date back to infancy or early childhood, do not constitute such other manifestations. J.

W. Courtney (Med. News, June 22, 1901).

The aura is an aid sometimes in deciding the etiological diagnosis. A sensation of coldness preceding an attack is said to be, especially if associated with subnormal temperature, almost diagnostic of cardiac epilepsy. A warning of præcordial anxiety is also suggestive of this type. The aura often constitutes a guide to the location of the cerebral lesion, as, for example, in the patient reported by Brevor and Horsley, in whom an aura of a horrible taste and smell pointed to the uncinate and hippocampal gyri, found to be the site of the causative lesion upon post-mortem examination. The interval between the aura and the attack varies. At times it is exceedingly short; in others the interval is sufficient to permit the patient to prepare for and prevent the attack.

The paroxysmal stages should always, if possible, be studied personally, or through a competent or preferably a trained observer or nurse. The statements of the patient are obviously unreliable. The most important phenomenon to be noted in this stage is the location of the first convulsive movement, or, as it is called, the signal-symptom. This initial motor spasm, close in significance to the aura, is even more valuable at times in pointing toward the cerebral area involved by the lesion. Spasms, always beginning in the right foot, for example, point to the upper left Rolandic cortex, etc. The value of the signal-symptom is greatest the earlier it is recognized. Epilepsy of long standing, even though dependent upon a focal lesion, tends to become general.

The post-paroxysmal period is quite as important for the determination of essential facts as either of the other two and in much the same way. A mono-

plegia,—or limited sensory loss,—an aphasia, or an acute psychosis may possess an even more positive pathogenesis and localizing significance than the aura, or signal-symptom. The interparoxysmal period is quite interestingly filled with curious phenomena in many cases. Various states of mental alterations or abnormality, of amnesia, and morbid propensity may appear and may decide entirely the question of prognosis. Evidences of essential degeneracy, manifest in stigmata, are conveniently considered here. Asymmetry or abnormality of development, especially of the skull, undue elevation of the palate-roof (Gothic arch), a deficient number of teeth, undue elongation or eversion of the coccyx,—the rudimentary tail of Féré,—are among the large number of stigmata observed.

Diagnosis.—The recognition of epilepsy, in its typical form, is ordinarily a matter of no great difficulty. As, however, convulsions from uræmia, dentition, etc., do not differ materially from epilepsy except in the matter of habitual repetition, it is necessary to consider all the collateral facts in addition to the seizure itself. A history of repeated convulsions of abrupt onset and without immediate assignable cause is, in itself, almost diagnostic. Even with such a history, however, the individual patient should always be given the benefit of a cautious differential examination, which should invariably include a careful urinalysis. Aside from the accidental or incidental convulsions which may accompany other diseases, such as nephritis, diabetes, certain forms of meningitis, etc., there are only four conditions which are likely to confuse the diagnosis: tetanus, malingering, syncope, and hysteria. Tetanus differs from epilepsy in the two facts of retained consciousness and tonic spasm alone, clonic spasms be-

ing absent. The detection of malingering will at times, as in the famous case of Clegg, the “dummy chucker,” prove quite difficult. It is seldom the case, however, that a malingerer will learn his part as well as Clegg, and few of them will have the stoicism to withstand the tests of pin-prick, hot iron, ammonia-vapor, etc., which are indicated in suspected cases. Clegg, by the way, was brought to an acknowledgment of malingering by being confronted with the fact that in his spasms he violated a physiological as well as a physical law, in that the thumb was contracted in flexion *outside* instead of *inside* the other fingers.

In simple syncope there is no motor spasm.

Hysteria is really a form of malingering, and the same tests apply. Here, as with other manifestations of hysteria, the disease-picture simulated is nearly always overdone. A strikingly-constant physiological mistake of the hysterical is the reversed of the epileptic order of the convulsive movements, beginning with the clonic instead of the tonic, or mixing them up indiscriminately. If the patient happens to be a woman and of any of the Latin races (and I would add Polish Jews) it is necessary to exclude, with special and elaborate caution, major forms of hysteria. In many forms of minor epilepsy, especially in cases in which the disease manifests itself through the medium of psychical or sensory equivalents, a positive diagnosis is possible only after continued and close observation of the individual patient.

Prodromal symptoms are frequent in epilepsy, rare in hysteria; the aura is seldom absent in epilepsy, and the accompanying hallucinations often urge the patient to murder, burnings, and robbery; the aura is much less frequently present in hysteria, and the accompanying hallucinations are less

alarming, but are of longer duration. The initial cry in epilepsy is piercing, the patient grows pale, and falls unconscious, possibly wounding herself; the hysterical patient is never entirely unconscious, and does not suffer any injury. The dilatation of the pupil, rigidity, congestion of the face, and salivation are more constant in epilepsy than in hysteria. The tonic and clonic convulsions are much more intense in epilepsy, incontinence of urine and feces is more frequent, and there is usually present complete anæsthesia,—occasionally hyperæsthesia. The pulse during the epileptic seizure is small, scarcely palpable, but slightly changed during the hysterical attack. The termination of the attack is more lytic in epilepsy, more critical in hysteria. Finally, the hysterical is particularly susceptible to suggestion and hypnotism, and their attacks may be, by these measures, controlled for a long time, whereas the influence of these agents over the epileptic is minimal. *Bonjour (Revue Méd. de la Suisse Rom., No. 2, '96).*

The great-toe reflex in epilepsy, a new diagnostic sign. Case of Jacksonian epilepsy in which this phenomenon could be evoked immediately after the attack on the convulsed side, while in the intervals free of attacks the plantar reflex was normal. *J. Babinski (Semaine Méd., No. 4, '98).*

Case of a patient suffering from intracranial tumor, and subject to attacks of generalized convulsions, with loss of consciousness and incontinence of urine and feces in addition to loss of the anal reflex, in which the great-toe reflex was observed on both sides, while the tendon-reflexes remained unaltered. In a quarter of an hour after the beginning of an attack, the patient, having now regained consciousness, the anal reflex reappeared, and the cutaneous plantar reflex was normal. *J. Babinski (Soc. de Neurol. de Paris, July 6, '99).*

Cardiac epilepsy cannot, in its incipency, in some cases, be differentiated from angina pectoris. The association of arteriosclerosis or other evidences of vascular degeneration, common to both

conditions, adds to the confusion. Epilepsy occurring only at night may exist for years unrecognized. Sleep-walking, persistent nocturnal enuresis, and other similar phenomena should always suggest an inquiry as to the existence of epilepsy.

In the epileptic psychoses a dream-like, altered condition of consciousness is probable, and not by any means a total or partial amnesia. The most various transition-forms occur between the different forms of so-called acute and chronic epileptic psychoses. Epileptic or epileptoid conditions and psychoses must alike be reckoned as symptoms of cerebral disease. The transitory, dreamy states are characterized by the rapidly-recurring, apparently orderly, indifferent, and inconspicuous manifestations, and by unusual, unexpected, often violent, acts. There is no epileptic psychosis without epileptic or epileptoid antecedents. Epileptoid conditions are more frequent than is commonly supposed, especially vertiginous attacks. With the lack of epileptic or epileptoid manifestations, all other symptoms, such as amnesia, similarity of the attacks, peculiarities of actions, sensory hallucinations, will serve to make the diagnosis of epilepsy most probable. *E. Siemerling (Berliner klin. Woch., Nos. 42, 43, '95).*

Clinical study of a recently observed phenomenon, *i.e.*, analgesia of the ulnar nerve (*Biernacki's sign*) in the epitrochlear space, between the internal condyle of the humerus and the olecranon. One hundred and thirty epileptics, including 80 females and 50 males, were observed. Of the 80 females, 40, or 50 per cent., showed normal ulnar-nerve symptoms on both sides. In 11 cases, or 23 per cent., there was diminished sensibility on both sides. Normal sensibility of one side only was present in 9 cases, while there was complete analgesia on both sides in 14 cases, and complete analgesia on one side in 10 cases. Thus there were 55 per cent. normal nerves, 20 per cent. with diminished sensibility, and 24 per cent. with complete analgesia. In 50 male epileptics 58 per cent. showed normal sensibility, 28 per cent. diminished

sensibility, and 14 per cent. were analgesic. This symptom should not be considered as one of the stigmata of epilepsy. As a helpful sign in the diagnosis of hysteria from epilepsy, however, it may have some value. Lannois and Carrier (*Revue de Méd.*, Nov., '99).

Syphilitic epilepsy may be recognized from the history of infection, together with a history of the symptoms, which are, with remarkable constancy, premonitory of syphilitic invasion of the brain. Unless the epilepsy develops in early or middle life, without other assignable cause, the first convulsion having been preceded by periodically-recurring headaches of evening onset and nocturnal exacerbation, associated with marked insomnia, or, less often, somnolence, with general malaise, and irritability of temperament, the diagnosis of syphilis, as a source, should be rejected in spite of a history of infection. If this prodromal syndrome be present, it should be strongly entertained in spite of a denial of infection.

Etiology.—Heredity, age, sex, occupation, and the history of previous or co-existing disease, or injury, are all factors demanding investigation in determining the etiology in every case of epilepsy.

Heredity is remarkably common as an etiological factor, especially in idiopathic epilepsy.

Two cases of epilepsy in which there was a shortening of the humerus on one side of the body, and attention called to the fact that there has been but one other case of epilepsy reported in which this stigma of degeneration is emphasized. L. P. Clark (*N. Y. Med. Jour.*, May 13, '99).

Epilepsy is a symptom of some brain disease; its continual presence tends toward mental deterioration. The mental responsibility of the epileptic depends upon the extent to which mind or self-control has been impaired by the epilepsy. The legal test of insanity is not sufficient, as mental irresponsibility is

not incompatible with a knowledge of right from wrong. Epileptics are, to some degree at least, responsible for criminal acts, more especially when the epilepsy is produced by their own fault. Criminal acts of epileptics appeal to medicine rather than to law for their proper adjudication. In all cases of murder in which epilepsy is proven the law should be amended to allow of like commitment to an insane hospital rather than to the penitentiary. The mental responsibility of the epileptic in case of murder should be referred to a medical commission, appointed by the court, which again may be referred to local or county medical societies to name its members. John Punton (*Med. Record*, Nov. 15, 1902).

Heredity is variously estimated as present in from 15 to 50 per cent., Hamilton believing that it exists in one-half of all cases. It should be borne in mind, however, that he included immediate and collateral ancestral phthisis and apoplexy as evidences of heredity, which is not admitted by most clinicians. Epilepsy itself in the parent or grandparent or brother or sister is quite frequent. I have found parental epilepsy alone in 15 out of 77 cases. Insanity, migraine, alcoholism, consanguinity of parents, and major hysteria are among the more common ancestral taints observed. In Gowers's table of 1450 cases heredity appeared in the history of 36.6 per cent. As regards age, epilepsy is peculiarly—though not exclusively—a disease of childhood and early life.

Study of 120 cases of epilepsy in 7 of which there was a history of typhoid fever. In 4 of these there was entire absence of family tendency toward nervous disturbance or personal history of any such conditions as infantile convulsions which might have been the cause of the epilepsy; it seemed, therefore, probable that typhoid fever was the cause of the disease. They had had typhoid fever shortly before the outbreak of the epilepsy, and the fever had been

severe and accompanied by violent delirium. Typhoid may act as an accidental exciting cause in those predisposed by hereditary influence and in those predisposed by infantile affections, as convulsions, etc., or in a certain number of cases it does of itself cause the disease, probably from the effect of toxins. Dide (*Revue de Méd.*, Feb. 10, '99).

Of Gowers's cases, 422 occurred under the age of 10 years, and 1087 under the age of 19 years.

According to the same table females show a somewhat greater predisposition to the disease than males (females, 54.6 per cent.; males, 46.4). This relative difference is really greater than is indicated by these figures, if we take into consideration the greater exposure in males to cranial and other accidents, which are frequent causes of epilepsy. The occupation is often a side-light upon the etiology. Epilepsy in sailors or prostitutes suggests syphilis; liquor-selling suggests alcoholism; painting and plumbing suggest lead as a cause.

Alcoholic epilepsy is divisible into three classes: (1) the convulsive and maniacal type, (2) dementia and confusional states, and (3) automatic trance and psychical cases. Hereditary tendencies and predispositions, together with condition of the patient's health, are recognized as factors in varying the type of the disease. Reference made to the development of the delusional states among epileptics, the common manifestations being fear of death or injury, which is usually but temporary. Cases reported illustrating each of the three forms of the disease, and, as a sequence of the first mentioned, pneumoparesis; of the second, cerebral hæmorrhages and nephritis; while epileptic convulsions were more common in the third. Homicide and suicide are more frequent in the former two classes. Reference made to the increase of alcoholic epilepsy, which is considered to be due to the change in the character of the spirits

used over those employed in former years, wood alcohol being believed to be among the notable constituents in the newer mixed drinks. For the treatment of these cases total abstinence, nerve and brain rest, sharp elimination, restricted diet, and a radical change in business and surroundings are thought to be the most efficient methods. (T. D. Crothers.)

There is probably no distinct form of epilepsy that could be properly called "alcoholic epilepsy." The author is rather inclined to look upon alcohol as one of a class of a number of causative agents of this condition, and he also expressed the opinion that it was quite as likely that the epilepsy acts as a cause of the patient becoming an inebriate. It was thought well to confine the classification of these conditions to as few headings as possible, as too large a variety of names for the same disease would be apt to lead to confusion. (J. H. Lloyd.)

A great many of these attacks due to an acute congestion of the brain. Case of a man referred to who during the recent warm spell was seized with an attack of typical epilepsy. When seen by the author he was suffering from his fourth convulsion; venesection was promptly performed, and in a few days the patient was apparently well. (F. Savary Pearce.) *Proceedings of the American Medical Association* (New York Med. Jour., June 14, 1902).

Although it was impossible to secure data in many cases, the writer thinks a definite history of the various neuroses of alcoholism was found in 46.5 per cent. of the total. Alcoholism, epilepsy, and insanity combined were responsible for 38.6 per cent. of the total cases, and paternal alcoholism existed in 18 per cent. of all cases. Diseases other than those connected with the nervous system have little hereditary influence in epilepsy. The age at onset is influenced by the character of the heredity. A. B. Wright and C. F. Haviland (*American Journal of Insanity*, July, 1903).

Certain diseases tend to develop an instability of the nervous system, and thus

predispose the subject to the subsequent development of epilepsy.

Epidemic and sporadic cerebro-spinal meningitis, insolation, scarlet fever, typhoid fever, and other kindred diseases, if attended with prolonged high temperature or toxæmia, may lead to the development of epilepsy, the relationship being apparently one of cause and effect.

Disease of the heart or blood-vessels interfering with the circulation in the brain and its nutrition is properly regarded, we think, as a sufficient explanation of the etiology in certain cases of cardiac and so-called senile epilepsy, and perhaps in other obscure cases. With regard to the organic and toxic epilepsies, the etiology and pathology is that of the primary organic disease, the epilepsy in such cases appearing only as a single, though sometimes the most important, symptom. Any source or irritation within the cranial cavity, whether chemical or mechanical, may—though it by no means must—induce a convulsion.

The simultaneous occurrence of epilepsy and disease of the heart is usually accidental and is most probably not dependent on the same primary organic disease. Epilepsy may give rise to transient dilatation of the heart, but not to any permanent cardiac disease. When the two diseases are present together the cardiac disturbance is not the sole cause of the epilepsy, but other etiological influences—such as the neuropathic predisposition, alcoholism, etc.—are also operative. Heart disease and arteriosclerosis favor the occurrence of epileptic attacks in so far as they influence the circulatory conditions in the cortical centres. This is observed with peculiar frequency in old age as manifested in senile epilepsy. Stintzing (Jour. Amer. Med. Assoc., Feb. 3, 1900).

Of interest in connection with the subject of general predisposition to epilepsy are the statements of Peterson that the disease bears a ratio to the general popu-

lation in this country of 1 to 500, and the further statement by Gray that a considerable majority of all epileptics have dark hair and eyes.

Reflex epilepsy, the existence of which is somewhat widely questioned, quite probably occurs, but in comparatively rare instances. Among the innumerable conditions of peripheral disease which have been noted as bearing an apparently causative relationship to the development of epilepsy are phimosis, adherent prepuce or clitoris, stenosis of the uterine os, nerve-cicatrices or surgical disease of the limbs or joints implicating nerve-trunks, carious teeth, eye-strain (esophoria, exophoria), obstructive disease of the nasal passages, aural disease, etc., etc.

There is much to support the reflex theory in both experimental and clinical experience, although, as with many other phases of the subject, it is, as yet, no more than a theory.

Pathology.—The true pathology of idiopathic epilepsy is as yet an unwritten chapter in the history of the disease. We have reason to believe that the essential location of the conditions causative of the explosions which constitute epilepsy is in some part of the brain-cortex. The theory of interference with inhibition through irritation of the higher cells of the cortex, a theory elaborated *in extenso* by Hughlings-Jackson, is generally accepted, but not yet proved. This theory is not inconsistent with the experimental conclusions of Nothnagel tending to establish the fact of the existence of a lower convulsive centre in the floor of the fourth ventricle (pons).

If epilepsy can be caused by irritation or extirpation of certain portions of the cerebral cortex, we should find in the brains of epileptics certain manifest pathological changes, and some authors have described such alterations, consisting essentially in proliferation of the

neuroglia. Seventy brains from cases of epilepsy examined. Out of 50 of these which gave typical clinical pictures, 25 showed no change whatever in the cornu ammonis nor in the motor area of the cortex. In the other 25 cases the cornu ammonis was diseased on the right side 11 times, on the left 13 times, and on both sides once. The changes consisted of atrophy of the pyramidal cells in the third layer, which sometimes extended a considerable distance toward the termination of the gyrus. Sometimes these cells had almost disappeared; in other cases they contained yellow pigment. In the stratum granulosum the cells were not uniformly atrophied, some apparently escaping the process. The myelinated fibres proceeding from these cells showed a corresponding degree of atrophy. The subependymal layer, however, was in all cases normal. These atrophied structures were replaced by a dense net-work of neuroglia fibres, but a pathological formation of this tissue could not be detected. There appeared to be no difference in the changes presented in the old and young cases; that is to say, old epileptics did not apparently show a more advanced stage of the process than those in whom the disease had existed for a very short time. No distinction could be observed in the clinical symptoms of the two groups; those with the cornu ammonis so altered having approximately the same type of symptoms as the others. Three of the cases never had *grand mal*, and, therefore, the sclerosis cannot be ascribed to excessive discharge of motor impulses. Bratz (Archiv f. Psychiatrie, B. 31, H. 3, '99).

The study of the morbid anatomy of epilepsy has so far been equally inconclusive. The abnormal conditions noted have varied with different observers even with the vastly-improved laboratory-technique employed within recent years. The tuberous or hypertrophic sclerosis, found chiefly upon the convexity of the convolutions, by Barthez and Rilliet; the "gliosis" invading the normal cellular tissue, as described by Chaslin; the vacuolation of cortical cells with increase of

spider-cells, found by Bevan Lewis; the hyperplasia of neuroglial tissue, with reduction in size and deformity of the cells, as observed by von Geison; these are all interesting and perhaps important; but numerous and insurmountable objections exist in each instance to their final acceptance.

In the majority of deaths in *status epilepticus* there was found vascular lesions and extravasation of blood into the cortex and the medulla, with destruction of adjacent nerve-elements. When these lesions occur in the medulla they are often the direct cause of death. In other cases they cause damage to the circulatory and respiratory systems, paresis of the limbs, and psychical disturbance, according to the positions in which they occur in the brain. Weber (Wiener med. Woch., No. 4, '99).

The lesion is a general one affecting the entire cortex; it involves most extensively the cells of the second, or so-called pyramidal, layer type,—the cells which present a relatively larger surface exposure to the circulating poison in proportion to their volume than the larger pyramids; the presence of a marked neuroglia proliferation. The changes in the cell are quite analogous to those definitely known to be caused by toxic agents, as furfural, alcohol, and the tetanus bacillus and its toxins. Regarding the nature of the lesion, the authors have examined the cortex in twenty-one cases from the Craig colony. The same lesions were uniformly found present in all. The evidences of cortical degenerations were general. The expression of acute and chronic exhaustion was shown in a diffuse chromatolysis and other characteristic protoplasmic changes. The manifestation of a vital intoxication of the cell was presented in a swollen nucleus, a destruction of the nuclear membrane and intranuclear network, and, finally, an abstraction of the nucleolus was rendered easily possible by the knife, it behaving as a loose body in the nucleus. Contributory evidence of the ultimate disappearance of the cell from the cortex was manifest in an in-

filtration of the cortex with leucocytes and a progressive gliosis. From the nature of the lesion they infer that epilepsy is a highly sensory motor reflex phenomenon. L. P. Clark and T. P. Prout (Med. Record, Feb. 14, 1903).

Epilepsy is an organic disease, an opinion based upon a personal study of 2000 cases of epilepsy of which he has satisfactory records. The recognition of Jacksonian epilepsy of several different types is now universal. This form is admitted to be a symptom of organic disease, though the nature of the latter may vary considerably. The character of the attack is uniform because the disease produces a uniform kind of irritation. In 38 per cent. of the writer's cases of ordinary epilepsy the attack was preceded by an aura, which was identical in many cases with the sensation starting a Jacksonian attack; the only difference between a Jacksonian attack of the motor type and the idiopathic form is in the extent of the spasm. The Jacksonian attack may run into a general motor spasm, showing that there is no essential difference between the two. The same may be said of the sensory attack. In many cases the fit begins with a cry, a discharge from the motor speech centre. If the Jacksonian attack becomes severe and widespread, consciousness is apt to be lost. The close resemblance between Jacksonian and ordinary epilepsy in 23 per cent. of the writer's cases seems to him to offer an argument that, in these cases at least, the ordinary type of epilepsy is due to organic lesions. Another argument in support of his proposition is found in a study of cases of maldevelopment of the brain. Of 400 such cases, elsewhere analyzed, 156, or 39 per cent., were subjects of epilepsy. It is not uncommon to suppose a child to be suffering from epilepsy only, and yet careful inquiry shows a previous apoplexy. Among 2000 cases of epilepsy, 192 showed positive signs of maldevelopment of the brain. Of his cases of epilepsy, 68 per cent. developed before twenty years of age; in other words, during the period of brain development. The writer maintained that many cases

of idiopathic epilepsy are actually cases of maldevelopment of the brain, and that the epilepsy is the manifestation of this organic disease. The incurability of epilepsy affords another argument for the organic nature of this disease. There is no question that proper care and treatment can reduce the frequency and sometimes mitigate the severity of the attacks. The author has come to the conclusion that the surgical treatment of epilepsy by exposing the brain and removing irritating foci offers as little hope for cure as does medical treatment. He has records of about 50 cases of Jacksonian epilepsy treated by trephining, and has yet to see a case in which such operative treatment has been followed by a permanently satisfactory result. Another argument for the organic basis of epilepsy may be found in the alleged causes of the disease. The first of these is heredity; the second in frequency is trauma of the head. That trauma of the head is a more potent cause than trauma elsewhere is well shown by the statistics of the Franco-Prussian war. These showed that out of 8895 wounded in the head, 46 became epileptic, whereas out of 77,463 persons wounded elsewhere only 17 became epileptic. The epilepsies of advanced life can almost invariably be traced to endarteritis and atheroma. Fright is undoubtedly a cause of this disease, as 119 of the author's patients had the first fit after a severe fright. One great stumbling block to the adoption of the theory of the organic origin of epilepsy is the multiplicity of causes enumerated by pathologists. The epileptic attack is the symptom, not a disease. The disease is a disorder of control. It seems far more reasonable to admit that epilepsy is an organic disease of the brain characterized by a lack of control of the mechanisms over motor energy. If this rule is adopted, we will more readily admit that it is incurable, and will be more willing to aid in the establishment of colonies for epileptics. M. Allen Starr (Proc. N. Y. Neuro. Soc.; Medical Record, January 30, 1904).

Our knowledge as to the pathogeny of epilepsy is scarcely less obscure and no

more satisfactory. Anæmia or hyperæmia in extreme degree may, either of them, excite a convulsion. This is a fact of experimental demonstration as well as of common clinical experience. Mechanical irritation—as from trauma, neoplasm, or foreign bodies—is an agency capable of inducing convulsive attacks, as is well known.

Transmitted irritation from the periphery, through the medium of some local condition of disease—as, for example, an injured nerve—may excite a convulsive explosion of the corresponding cortical centre. Carious teeth, stenosis of the uterine os, volvulus of the intestine, adherent prepuce, and many other conditions of local disease may, through the medium of transmitted irritation along the afferent nerve-trunks, provoke an explosion of the related cells of the cortex. Such cases constitute the much-questioned, but undeniably existent, class of reflex epilepsies. Finally, we have as a factor in the pathogenesis of epilepsy certain states of toxæmia, some of them autogenous in origin, others depending upon the introduction from external sources of poisons with a relative affinity for the cortex.

The toxic epilepsies—those which are as yet positively determinable as such—are not numerous. There is reason to believe, however, that much more information remains to be gained as to the true pathogeny of epilepsy from the crible and the chemist than from the scalpel and the anatomist.

The frequency of nervous lesions in epileptics is difficult to establish. The ordinary examination is too open to oversights, and must be very systematic in order to justify the verdict of negative findings. The great variation in the number of sclerosed cornu ammonis, diffused gliosis, small foci of softening quoted by various authors, is certainly,

to a large extent, an expression of variable attention, a picture of the psychology of investigators rather than of the distribution of facts.

Concerning the chemical investigations, the same psychologic factor of personal interest is even more deleterious to a fair comprehension of the facts. The truism that observation of the rules of hygiene in every direction is a great factor in the management of epilepsy is decomposed into innumerable currents of interests. Nothing short of unprejudiced and complete series of investigation will help us here, and also a much greater conservatism with complicated methods, such as the tests of toxicity, the results of therapeutics, etc.

All these conditions are difficult to attain except in sufficiently equipped institutions, for which funds should be made available by the state, and by scientific corporations, so that they may work free of the need of sensational results, create a sound basis in clinical work, and systematize the investigation according to methods which can be admitted as safe and fruitful.

To what extent this had best be carried is a question requiring much judgment. The one thing is certain—and every move in this direction should receive credit and encouragement—that institutions should be given a chance and should even be put under the obligation of doing justice to medical observation, of promoting the medical interests of its physicians, and of laying a good foundation of experience, such as the isolated practitioner can never get for himself. On such ground more delicate investigations will find a healthy soil. Adolf Meyer (*Medical News*, July 18, 1903).

Prognosis.—The prognosis in epilepsy may be said to be progressively bad in a direct ratio with the number of attacks or the duration of the disease in the patient affected. If of long standing, the prognosis is bad, regardless of the cause. One convulsion, even though it be accidental, invites another, and, if repeated a few times, the convulsive habit is es-

established and is curable only in rare instances. Organic epilepsy dependent upon focal disease of even circumscribed limits is no exception to this rule, unless recognized promptly and treated properly by surgical procedure at once. Epilepsy due to syphilis, if promptly treated, can be cured; if treatment is delayed, it quickly becomes as intractable as any other form of the disease. This is true also of the toxic and reflex varieties. The element of heredity is of sinister significance in proportion to the intensity with which it may appear in the individual family history. The age of onset is of importance in prognosis, both as regards the curability of the disease and the development of serious complications. In epilepsy beginning in early childhood the tendency to the development of *status epilepticus*, a condition dangerous to life, is increased. I have seen this condition in seven cases, and in every one of them the disease began before the age of ten years. The development of dementia is more probable the earlier the onset of epilepsy. Mania as a complication is more likely to be found in cases developing at puberty or later in life. Epilepsy developing without assignable cause at middle age (the *épilepsie tardive* of Forel) seems more amenable to treatment and the prognosis is rather better. In one such case, however, observed by the writer, the disease having developed after the age of thirty, there being a history of parental syphilis, the patient died in an epileptic attack, the disease having persisted for several years. Death from or during an epileptic seizure is not uncommon. The *status epilepticus* is especially dangerous to life. Paralysis of the cardiac or respiratory centre is usually the immediate cause. Mechanical asphyxia is not infrequent. No reputable life-insurance company

will accept an applicant known to be affected with epilepsy.

What constitutes a cure in epilepsy? Freedom from attacks for one, two, five, or even ten years cannot be considered as final evidence of cure, since it has been the personal experience of every neurologist to note recurrences after such intervals of remission. I myself have known a patient to exhibit a spontaneous remission for twenty-three years, the attack recurring without determinable new cause, and in exactly the same form, clinically, as at first. G. M. Hammond takes the position that relief from attacks for one or two years constitutes a cure, subsequent recurrences to be considered as new attacks. The objection to this teaching—there are many—is that, in some patients in whom the disease lasts through life, the attacks may be reported by intervals of a year or longer throughout the disease. Personally, I do not believe in the radical cure of epilepsy, if the disease has persisted for more than two years, except, perhaps, under an ideal environment attainable only in specially equipped institutions.

Of importance in estimating the prognosis is the presence or absence of stigmata of degeneration. Epileptics exhibiting cranial asymmetry or anomalies of development or well-marked intellectual or moral perversions are notoriously patients admitting only the most pessimistic prognosis. Well-marked periodicity in the occurrence of attacks in a subject constitutes a factor somewhat favorably modifying the prognosis.

A cautious prognosis should be made in any case of epilepsy in which the sleep-stage is habitually omitted, and in which the patient is constantly afflicted with severe frontal headache. L. Pierce Clark (N. Y. Med. Jour., June 19, '97).

From 5 to 10 per cent. of all cases are curable. Emphasis laid on the necessity

of a long continued course of treatment, to extend over not less than two or three years. It should be carefully mapped out and executed to the letter, not only along one but many lines. Failure to secure good results in the treatment of epilepsy is usually due to a failure to treat the individual and his disease as a unit. The drug treatment alone, while invaluable in many cases and of some use in every case, often fails completely to meet the most important requirements. The prognosis in an individual case can only be given after observation extending over from six to nine months. W. P. Spratling (N. Y. Med. Jour., Apr. 9, 1904).

Medical Treatment.—The ideal treatment of idiopathic epilepsy is, in my opinion, attainable practically only through institution environment, organized on the colony-plan, or as it is in Ohio or at Sonyea, New York. The necessary regulation of the habits, diet, clothing, exercise, sleep, and the employment of various adjuncts, direct and indirect, such as hydrotherapy and gymnastics, and appropriate culture of the mind and morals, can be accomplished systematically only in an institution established and conducted for such a purpose.

The experience of the epileptic colony at Chalfont, St. Peters, Bucks, during the four years of its existence, pointed to the fact that the younger the epileptic and the sooner he was admitted after the onset of the seizures, the more satisfactory the result of the general management and *régime* adopted. The principles directing the management are simple: (a) removal of the epileptic from town to country; (b) regular employment under direction; (c) the maintenance of a well-ordered and regular mode of life, with avoidance of excitement and abstinence from alcoholic liquors; (d) abundance of good nourishment of a simple nature. The general result was that the fits in the majority of cases diminished both in number and

severity, in some cases to quite an extraordinary extent; the physical health materially improved, while the mental condition in all but a few cases showed obvious improvement. Aldren Turner (Brit. Med. Jour., Apr. 23, '98).

The early treatment of reflex epileptic phenomena is of great importance. Many cases of nocturnal epilepsy pass unrecognized until far advanced. Out of 485 persons admitted to the Craig Colony, 83 per cent. had developed the disease before the age of 20 years, and 20 out of a series of 145 had given manifestations of the disease as early as the sixth month of life. Before making a prognosis or instituting treatment it is well most carefully to consider the ancestry. Drugs, the chief object of which is to suppress the convulsive phenomena, should not be given young subjects, for such treatment not only is liable to mask the disease, but experience has shown that it will seriously impair the digestive and assimilative functions. It is wrong to operate upon an epileptic brain after an injury and years of convulsive seizures. A study of the aura, which is the "sign-post" to the treatment, is important. The colony plan allows of the entire and much-needed control of all the habits of life of the individual. W. P. Spratling (Med. Record, Oct. 28, '99).

Where this is impossible, some such general plan as the following is advisable: Epileptics should be given some employment always, preferably physical and congenial and out-of-doors.

An epileptic child should lead a simple, regular life, as much as possible out-of-doors, away from the excitement of a great city or from association with many children. Editorial (Pediatrics, May 1, '98).

The diet should be regulated to two meals a day. Plain, wholesome food simply and properly cooked should be given liberally, but not in excess. Epileptics should be trained to eat slowly and to thoroughly masticate all food.

Very little fluid should be allowed with meals. No special constant diet table is

either necessary or advisable, except in individual patients in whom some special indication exists. The two meals should be given at 10 A.M. and 5 P.M. The patient should be required to drink water freely and at regular intervals between meals—as much as three or four pints should be taken daily. The living rooms should be light and never overheated or contaminated by impure air. Epileptics should be carefully protected from exposure to extremes of temperature. Tonic baths at proper intervals, keeping the skin active, and assisting in general nutrition are valuable, but there is no special system of hydrotherapy which will cure epilepsy.

As regards the drug treatment, we are still dependent upon the bromides. Animal extracts, antitoxins, and various other sensational specifics, including hypnotism, have been vaunted in recent years, but have failed to stand the tests of trial fairly made. (See *ANIMAL EXTRACTS.*)

Most of the ill effects of the bromine might be avoided if the drug were given more freely in the early stages of the disease. The writers use potassium salts alone, not having found any special advantage by giving the mixed bromides. Whichever of the salts is used, a single dose is best given an hour before bedtime in nocturnal epilepsy and two hours before the time of the occurrence of the attack if there is a well-marked rhythm. Morphine hypodermically, is one of the best drugs for the status, but the risks are great, and they rely more on large doses of chloral given by the rectum. Bromidin has been extensively used and favorably received. Tea and coffee should be excluded from the diet and a small amount of meat permitted. V. Horsley and R. Russell (*Lancet*, Feb. 14, 1903).

Clonic spasms can be suppressed and the consciousness restored by placing the epileptic on his left side during the tonic

period. This method of arresting the seizure was first proposed by McConaghey, of Edinburgh, and the author has found it successful in every instance in which it has been applied. Crocq (Fourteenth French Congress of Neurology and Psychiatry; *Semaine Medicale*, Vol. XXIV., No. 32, 1904).

The coal-tar derivatives—antipyrine, phenacetin, lactophenin, etc.—have also had their day, although their use is not altogether without benefit temporarily under certain circumstances.

Ethylene-bromide, amylene-hydrate, sulphonal, trional, curare, and solanum *Cariolensis* are a few among the hundreds of new remedies recommended which have proved of only slight value or useless altogether, or, as with amylene-hydrate and curare, worse than useless. Borax, preferably in the form of the biborate of soda, is an exception in that it rarely does seem to possess a positive value, especially in nocturnal epilepsy. The dose is from 15 to 60 grains once, twice, or three times daily. Very much larger doses have been given and have been well borne. In this variety of epilepsy, too, the hypnotics—sulphonal, trional, chloralamid, and urethan—have a useful purpose as occasional temporary substitutes for the bromides.

Santonin personally used for nearly twenty years in the treatment of epilepsy. It is a valuable antispasmodic in children, and under it the average epileptic patient shows better results than under the bromides, and has proved of especial value in those cases in which the bromides failed. It does not cause mental hebetude, nervous or circulatory disturbances, nor disfiguring eruptions. A dose of from 2 to 5 grains of the powdered drug may be given to adults and gradually increased to the point of tolerance. Many patients take 20 grains three times a day for some weeks. The point of saturation of the system is shown by a yellow color of

the urine and a varying degree of renal and vesical irritation. G. F. Lydston (*Ther. Gaz.*, Feb. 15, 1900).

Having noted in numerous epileptic cases deficient absorption and elimination of calcium, the writers administered various preparations of that drug by mouth and hypodermically in fourteen epileptic cases. A decrease in the number of seizures followed in nearly all the patients treated, diminution or increase in the frequency of the attacks corresponding to increased or diminished absorption of the calcium. In a few cases which were uninfluenced by the treatment it was ascertained that the entire amount of calcium administered had been eliminated in the feces. E. Audenino and A. Bonelli (*Riforma Medica*, Sept. 5, 1902).

In giving the bromides certain general facts should be recognized. The potassium salt is the most effective.

All bromide salts should be specially investigated as to purity of manufacture. Every dose of bromide should be given well diluted. The dose is inconstant necessarily and varies with the type and intensity of the disease in each patient. In an ordinary case, with attacks of moderate severity occurring four or five times a month, or less often, the patient should begin with 20-grain doses twice daily. This may be increased or diminished according to the effect. An insufficient dosage is practically useless; on the other hand, no unnecessary excess of the drug should be continuously introduced into the system, since bromism, if prolonged, induces a condition scarcely less deplorable than epilepsy.

Strontium bromide is far less apt to produce acne, mental depression, and gastric disturbance than the corresponding salts of potassium. Antipyrine, in doses of 10 or 15 grains a day, can be given with ammonium or strontium bromide for several months without ill effects. Editorial (*University Med. Mag.*, May, '97).

Sulphonal and trional will prove useful in a considerable number of the epileptic cases as adjuncts to the bromides, with which they can be profitably alternated. Frost (*State Hosp. Bull.*, Oct., '97).

The addition of compound syrup of the hypophosphites to the bromide of sodium and ammonium of distinct value in averting or diminishing dullness, muscular depression, and feebleness of circulation. Lloyd Andriezen (*Lancet*, Aug. 26, '99).

The bromides of ammonium and strontium are less depressing than the bromide of potassium. When large doses are given, strychnine should be coupled with the bromides to counteract the depressing effects of the latter. The writer favors a diet from which meat and eggs are excluded for a time. Fletcher Beach (*Lancet*, Aug. 26, '99).

Of the various bromides the preparation with strontium is far more effectual in the treatment of epilepsy than is that with potassium, sodium, or ammonium. Its sedative action is well marked; it causes but slight, if any, disturbance of the gastric functions, and it seems to act as a general nervous tonic. It neither impairs the mind of the patient nor produces anæmia, but, on the other hand, seems to benefit the circulation. One drachm four times a day to an adult, and proportionate doses to children, are recommended. Cullinan (*Lancet*, Oct. 7, '99).

A combination of diet, regular occupation, and personal hygiene with the bromides gives the best results in treating idiopathic epilepsy; the bromides, singly or combined, still remain the chief sedatives for the epileptic state: in the young epileptic, to secure a possible entire suppression of attacks and ultimate cure of the disease; in the adult, an amelioration of frequent paroxysms and comparative physical and mental comfort. The bromides to be effective in chronic and long-standing cases must be given in large daily doses to suppress convulsions: from 300 to 500 grains, if

necessary. They should be given gradually to find the sedative level, at which level it is the physician's principal duty to maintain them. Hot and cold baths, high enemas, alimentary antiseptics, and massage are absolutely essential to successful bromide medication. Bromine is a worthy substitute for the bromides in many cases in which the latter are contra-indicated and cannot be given in high dosage. Salt-starvation or semi-salt-starvation is a great adjuvant to the bromide treatment, and should be thoroughly tried in all cases in which bromides or bromine are apparently contra-indicated before they are discarded. L. P. Clark (Med. Record, Jan. 12, 1901).

If the attacks occur at more or less regular intervals, as at the menstrual epoch in women, such periods of attack should be anticipated by temporarily-increased doses. Gowers's plan is quite effective in some cases, though bordering on the heroic. He gives one full dose of potassium bromide in the morning after breakfast in half a pint of water, beginning with 2 drachms every second morning, increased to 3 drachms every third morning, and 4 or more drachms (an ounce sometimes) every fifth day. The dose and order of interval are then reversed and the treatment is continued in this way for six weeks; small doses are then given for a year or more.

Potassium bromide seems to be curiously limited in its power for good in the treatment of epilepsy. Occasionally after having been effective for weeks or months or even years, its effectiveness will, without assignable cause, cease. This is true not only of potassium bromide, but of nearly, if not every, other drug useful in epilepsy. Some other salt of bromide or several of them in combination (sodium, strontium, ammonium, lithium, are valuable in the order mentioned) or one or two of the bromides in solution with antipyrine or in combina-

tion with phenacetin may be advantageously substituted for the single salt.

Of 8 cases of epilepsy treated for a period of six weeks by Bechterew treatment, in 4 cases there was complete suspension of the fits, in 3 other cases the fits were replaced by infrequent attacks of vertigo, and in the last case there were four attacks of vertigo and two convulsions. The results were due to the combination of drugs and not to the bromide alone. De Cesare (Rif. Med., Aug. 13, '97).

Adonis vernalis may have some influence in attenuating the attacks, but it may cause them to occur more frequently. It has no advantage over bromide. G. Gianni (La Riforma Méd., Feb. 15 to Mar. 1, 1900).

Sometimes the addition of one of the motor depressants—as hyoscyamus, conium, belladonna, or their alkaloids—is quite as effective, at least temporarily. As a matter of further curious interest it has been proved by experience that in such cases a change to almost any new drug will result in temporary improvement: a fact which explains, in part at least, the almost limitless pharmacopœia of the disease.

Withdrawal of the bromides in cases of epilepsy long under bromide treatment is generally followed by improvement of the patient. At times this gain is startling. F. Peterson (N. Y. Med. Jour., No. 914, p. 738, '96).

The use of opium reintroduced recently by Flechsig is deserving of mention and a limited commendation. Flechsig's method consists in the daily administration of opium in the form of the solid extract in doses gradually increased up to several grains (12 to 15) daily, five or six weeks usually being required. Treatment by bromide is then substituted for the opium. This treatment is of distinct benefit in old longstanding idiopathic epilepsies which

have not been benefited by the bromides. It is contra-indicated in recent epilepsies and in the organic cases.

The Flechsig method of treatment is of but little value in chronic cases of epilepsy in which dementia has taken place to any marked extent. Clark (Amer. Medico-Surg. Bull., July 25, '96).

The best treatment of epilepsy is to put the system in such a condition that excitants to epileptic attacks, such as autointoxications from the gastrointestinal tract, from fatigue, from poisonous products, which should be eliminated from the body, will not develop within the body, and also to guard against those experiences which we have learned often precipitate attacks. Also so to influence neuromotor irritability in a sedative way that discharge of energy in the shape of explosion will be less likely to occur. As to neurasthenia, the writer finds that its treatment by rest, exercise, change of environment, isolation, hydiatics, massage, diet, avoidance of deleterious indulgences, and conformation to hygienic rules is so far superior to drug-therapy that he rarely uses drugs in these cases, unless to fulfill some pointed indication. Joseph Collins (Medical News, July 5, 1902).

Four remedies are deserving of special mention in connection with special forms of epilepsy for the relief of which they seem especially efficacious: nitrite of amyl and monobromated camphor in cases of petit mal, duboisine in hysteropilepsy, and the hydrobromate of coniine in the *status epilepticus*. Nitrite of amyl also possesses value as a drug which, if used promptly in cases preceded by an aura, will often prevent the further development of the attack. Chloroform by inhalations is at times temporarily useful in controlling the *status epilepticus*. I have found the use of cardiac tonics of positive value in combination with the bromides in what is known as cardiac epilepsies. The condi-

tion of the heart and pulse is the guide to the selection of the adjuvant drug.

To a certain extent, though far more limited than one would suppose from *a priori* reasoning, the etiology affords a basis for treatment. Antisyphilitic treatment should be at least given an energetic trial, as epilepsy is due primarily to syphilis. Such patients, however, as a matter of fact, are not often cured by this means, and, as a further fact of interest, it will be found that such patients do not bear well energetic specific treatment. Various toxic agencies or conditions of visceral disease, standing in a presumably causative relationship, should be treated, of course, but cure of the toxæmia or the visceral disease very rarely results in cure of the epilepsies.

Removal of sodium chloride from the diet and replacing it by a bromine salt tried successfully in 28 cases. Even the bread was prepared by baking it with bromide of sodium instead of table-salt. No symptoms of bromism appeared. Conclusion that in every case of epilepsy a diet deprived of sodium chloride is applicable and should be tried. The treatment is most successfully carried out in an institution. It is based upon the view advanced by Richet and Toulouse that the body is more susceptible to bromine when the chlorine has been reduced. The introduction of bromides into the nutriment and especially into the bread as a substitute for the sodium chloride is an agreeable way of administering the drug. R. Balint (Berliner klin. Woch., June 10, 1901).

A rise of temperature follows about 45 per cent. of all attacks, the temperature going highest, as a rule, after *grand-mal* seizures, in which muscular contractions are greatest; but also sometimes reaching 102° F. or over, in *petit-mal* and psychical attacks, probably indicating in the latter case the disturbance of the thermal centres in the brain.

Treatment demands that the epileptic and his disease be considered as a unit

and treated as such. As antispasmodics, camphor, opium and its derivatives, valerian, and belladonna are valuable. The opium-bromide treatment of Flechsig is valuable in some cases. In a case of *status epilepticus* the best formula for stopping the attacks is the following:—

B Potassium bromide, 2 ounces.

Chloral hydrate, 5 drachms.

Morphine sulphate, 2 grains.

Deodorated tincture of opium, 60 minims.

M. Add enough water to make sixteen ounces, and give the patient one ounce after he has had six attacks in rapid succession. Repeat in two hours if not effective. William P. Spratling (Jour. Amer. Med. Assoc., May 3, 1902).

Surgical Treatment.—The surgical treatment of epilepsy is limited to those cases recognizable positively as dependent upon an organic lesion of limited extent and surgically accessible, the location of the explosive focus being determinable at least approximately from the symptoms.

1. Surgical interference is advisable in those cases of partial epilepsy in which not more than one, or at the utmost two, years have elapsed since the traumatic injury or the beginning of the disease which has given rise to the convulsive seizures.

2. In cases of depression or other injury of the skull, surgical interference is warranted, even though a number of years have elapsed; but the prospect of recovery is brighter the shorter the period of time since the injury.

3. Simple trephining may prove sufficient in a number of cases, and particularly in those in which there is an injury to the skull or in which a cystic condition is the main cause of the epilepsy.

4. Excision of cortical tissue is advisable if the epilepsy has lasted but a short time and if the symptoms point to a strictly circumscribed focus of disease.

5. Since such cortical lesions are often of a microscopical character, excision

should be practiced, even if the tissue appear to be perfectly normal at the time of operation; but the greatest caution should be exercised in order to make sure that the proper area is removed.

6. Surgical interference for the cure of epilepsy associated with infantile cerebral palsies may be attempted, particularly if too long an interval has not elapsed since the beginning of the palsy.

7. In cases of epilepsy of long standing, in which there is in all probability a wide-spread degeneration of the association-fibres, every surgical procedure is useless. Sachs and Gerster (Amer. Jour. Med. Sci., Oct., '96).

Operation is indicated in all cases of (Jacksonian) epilepsy; in all cases where the epilepsy, be it general or partial, has followed and is apparently caused by a depression of the skull, the result of a traumatism. In many cases where a severe head-injury—even though there be external evidence—has been followed by a partial epilepsy, and where the "signal-symptom" indicates a definite area in the brain. A. J. McCosh (Amer. Jour. Med. Sci., May, '98).

Statistics prove that operative measures should only be employed in traumatic cases in which there are localizing features. J. C. Oliver (Canada Lancet, July, '98).

Results of operations for epilepsy in 160 cases collected from literature and 4 personal ones. In 31.1 per cent. no results were obtained. In 20.1 per cent. the time of observation after the operation was too short to warrant judgment. Fifteen and one-fifth per cent. were improved, and the majority of these permanently so. The cured cases reached 14.6 per cent.,—i.e., 24 cases,—of which 3 were observed for over three years, 13 over one year, and 8 over half a year. In short, 29.8 per cent. of cases were benefited by the operation, while 70.2 per cent. were not. The cases of traumatic Jacksonian epilepsy show a larger percentage of favorable results than observed in general epilepsy, while the death-rate after operation is much greater in the general epilepsy than in the cases in which the seizures are local-

ized. Matthiolius (Deutsche Zeits. f. Chir., June, '99).

Idiopathic epileptics with typical *grand-mal* seizures should never be trephined. Subjects of this kind, in whom seizures are of the Jacksonian type, should be trephined only when infantile cerebral palsies can be excluded, and when the family and personal degeneracy is at a minimum; if operation is determined upon in such cases, a very thorough removal of the epileptogenic area should be made; even then but a fraction of 1 per cent. recover from their epilepsy.

Traumatic epileptics may be trephined when the injury is definitely proved and stands in direct causal relation and has existed not more than two years. The prognosis will then largely rest upon the degree of the neurotic predisposition present. The earlier trephining is resorted to after convulsions begin, the better the prognosis. L. Pierce Clark (Med. Record, Jan. 12, 1901).

Epilepsy is the last disease to which surgical measures should be indiscriminately applied. In judiciously selected cases, radical operations of various kinds, suited to the individual needs of each case, have given far more satisfactory results than has non-operative or medicinal treatment. Every case must be studied as a problem by itself. The only general laws applying are those regarding the removal of peripheral or local foci of irritation and the destruction of paths of conduction which convey disturbing impulses. In each case we must decide as to the operative method by which we may best meet these indications. In order to attain the best results patients should be seen early. It would be well to have every epileptic carefully studied by an accomplished surgeon, who should review the case with a view to the possibility of surgical intervention. Operation, when indicated and undertaken, should be regarded as a first measure to be followed, and often preceded, by others looking to a correction of all faults of diet, of elimination, etc. Long-continued attention to these matters is the price of eventual success.

In those cases characterized by blanching of the face, when the seizures can be warded off or mitigated by the prompt use of amyl nitrite, we may well consider the propriety of an excision of the cervical sympathetic. Roswell Park (Amer. Medicine, Nov. 22, 1902).

Operations for epilepsy are distinctly disappointing and rarely curative, and are indicated in only a small proportion of cases. They frequently produce temporary benefit. They may save life, but they are not entirely free from danger, and occasionally leave the patient worse than before. The mortality, though small, is not inconsiderable. The actual number of complete recoveries is probably under 5 per cent. No case should be claimed to have been cured until from three to five years have elapsed since the operation. Even after operation medical treatment and supervision should be exercised for a long period of time. J. Chalmers Da Costa (Medicine, Feb., 1904).

To the above class of cases may be added that small number included in the etiological variety known as reflex epilepsies. In organic epilepsies the results of surgical treatment depend upon the accuracy and promptness of diagnosis, including localization chiefly, and secondarily upon the promptness with which surgical interference is adopted, and the personal skill and surgical judgment of the operator. Shock and hæmorrhage are practically the only immediate sources of danger, asepsis having eliminated other surgical complications. Both shock and hæmorrhage are avoidable or can at least be reduced to a minimum which does not endanger life. Wyeth's method of accomplishing this result in intracranial operations by dividing the operation of entrance into two or more surgical *séances* upon succeeding days is eminently satisfactory. So safe, indeed, is this method, as to have rendered perfectly

legitimate surgical entrance of the skull for purely exploratory purposes. The technique of the operative procedure varies with each case appropriate for operation, as well as in accordance with the surgical peculiarities of the operator. There is a growing pessimism representing the return-swing of the optimistic pendulum of ten years ago with regard to the value in results of surgical treatment for organic epilepsy. Von Bergmann and McCosh, among recent writers, unite in a demand for greater conservatism. Mason, quoted by Gray, tabulates 44 cases treated surgically, with two recoveries, or about $4\frac{1}{2}$ per cent. This table is capable of another interpretation, however, which is decidedly more favorable from the fact that in more than half the cases in which the time of observation after operation is said to have been "insufficient to confirm the claim of cure," further lapse of time may serve to establish the claim at least in some of these cases.

Analysis of 70 operative cases of epilepsy. Conclusions as regards prognosis: (a) A small percentage (4.03 per cent.) of the cases will be cured. (b) A certain larger percentage will be improved. (c) An even larger percentage will not be improved at all. (d) An operation upon almost any case will produce a temporary cessation of fits. Mason (Med. News, Mar. 21, '96).

The consensus of opinion among neurologists and surgeons at present seems to be that operations are indicated only in recent cases, within one year after the injury, in cases in which general epilepsy has followed, and in cases in which the attacks are of a purely focal or Jacksonian type, especially if an injury has preceded and corresponds to the motor centre presiding over the muscles which are the seat of convulsive movements. The reason that the operation does not give permanent relief in cases of long duration is explained by the theory that the epileptic habit has become estab-

lished, or that cortical degeneration has taken place which relief of the superficial irritation does not remove. G. E. Brewer (Med. News, Dec. 23, '99).

Almost all cases of epilepsy which come within the etiological subtype "reflex" demand surgical measures of relief, the removal of the peripheral course requiring, in most instances, the knife. Phimosi, cervical stenosis, carious teeth, nerve-cicatrices, diseases of the bones, eye-strain, and ovarian disease are all conditions for which the knife or other surgical or mechanical agents are indicated.

Castration performed in twenty-two cases, twenty of them in males, with favorable results. Everett Flood (Med. Record, May 23, '96).

Case of primary dysmenorrhœa with epilepsy, in a girl 17 years of age, who was cured after dilatation of the cervix uteri. Braithwaite (Lancet, July 31, '97).

In all cases of epilepsy, when such conditions or any one of them exists, either coincidentally, alone, or as the presumable cause, they should be appropriately relieved. It will not always, nor indeed often, cure epilepsy; but such conditions undoubtedly aggravate the epileptic tendency, and should be eliminated. I have never yet seen a case of epilepsy cured or even benefited permanently by operations upon the eye-muscles or by removal of the ovaries, and I have seen scores of patients upon whom such operations have been done.

The performance of normal ovariectomy for epilepsy is to be regarded as hardly better than malpractice. Lusk (Boston Med. and Surg. Jour., Oct. 15, '91).

Such operations should be done, though with discrimination and always with the frank acknowledgment to the patient of the uncertainty of results.

Resection of the cervical sympathetic in 45 epileptics. There was no trophic

disturbances nor was any influence noticeable on the general or mental condition of the patient. Of 19 patients observed for a considerable length of time, 55 per cent. were cured, 28 per cent. improved, and 15 per cent. were not improved. The operation is not indicated in cases with either mania or dementia; there are already organic changes in the brain, which no operation can help. In recent uncomplicated cases there is every reason to look for a satisfactory result. Jonnesco (*Centrab. f. Chir.*, Feb. 11, '99).

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EPISPADIAS. See URINARY SYSTEM, SURGICAL DISEASES OF.

EPISTAXIS.—Gr., *ἐπί*, upon, and *στάζω*, I drop.

Definition.—Epistaxis signifies bleeding from the anterior or posterior nasal cavities of traumatic or idiopathic origin.

Symptoms.—The symptomatology of epistaxis other than the blood-flow is somewhat modified by the nature of the exciting cause. In epistaxis due to traumatism the blood flows freely in most cases from one side; the hæmorrhage usually ceases of its own accord, and is not of long duration. In most of the other forms of epistaxis the blood trickles by drops, which follow one another in more or less rapid succession. In nose-bleed occurring as a result of cerebral congestion, premonitory symptoms, such as headache, tinnitus aurium, injection of the conjunctiva, etc., are usually experienced; but these are much improved or disappear altogether as soon as a certain amount of blood has been lost. In persons subject to hæmophilia, the attacks may occur at any time, the least exertion serving sometimes to bring on a severe epistaxis. When the condition is due to vicarious menstruation, it usually presents itself about the time the latter should begin, with intermittent recur-

rences during the usual duration of the menstrual flow. In general softening of the vessel-walls nose-bleed usually begins after an exertion, and is exceedingly difficult to arrest. When the bleeding originates in the vault of the pharynx, the blood flows posteriorly when the patient is sitting up or standing.

Etiology.—Epistaxis may be the result of blows upon the nose, falls, picking with the finger-nails, the introduction of a foreign body, forcibly blowing the nose, sneezing, etc. It is a frequent symptom of the majority of nasal tumors, and of the forms of rhinitis accompanied by ulceration.

The great majority of spontaneous epistaxes originate from the artery found near the anterior portion of the septum. The introduction of a pledget of cotton saturated with a 5-per-cent. solution of cocaine causes the bleeding to stop sufficiently long to enable the operator to find a punctiform erosion from which the blood oozes. Houdeville Martin (*Revue Gén. de Clin. et de Thér.*, Jan., '93).

The artery of the anterior (cartilaginous) septum may lie near the surface, be of considerable size, and, if atheromatous, may cause serious hæmorrhage. Gutchell (*Boston Med. and Surg. Jour.*, vol. cxxxi, No. 1, p. 9, '94).

In 250 cases, including 150 males and 100 females, seat of the hæmorrhage upon the cartilaginous portion of the septum in 219 instances. The causes were varied; small varicose veins or erosions furnished the stream in all but 11 cases, these being of arterial origin. Baumgarten (*Revue Inter. de Rhinol., d'Otol., de Laryn., et d'Ophtal.*, vol. iv, No. 15, '94).

Spot from which the hæmorrhage is situated on the septum about midway between the anterior and posterior margin of the cartilaginous plate, and the bleeding is caused by granulation-tissue. Such granulations removed with the finger-nail until all sponginess to the touch has disappeared. C. Seiler (*South-ern Clinic*, Oct., '95).

Epistaxis is a surgical affection and with certain rare exceptions is due to a definite local lesion requiring topical treatment. The exceptions are those cases where the whole pituitary mucous membrane is in an oozing condition, as in hæmorrhagic small-pox, purpura, and scurvy. Otherwise there is a definite local lesion, of which the "seat of election" is on the anterior inferior portion of the septum, almost immediately behind the nostril. Lermoyez (*Archives de Laryn.*, Nov. to Dec., '96).

Case of a child who had suffered from continuous nasal bleeding for three days; discovered a leech hanging over the posterior wall of the pharynx, and clinging to the posterior nares. The leech was removed and the bleeding ceased immediately. Several such cases have been observed in Beyrout, in which district leeches are present in the water. A. J. Manasseh (*Lancet*, Sept. 16, '99).

It occasionally occurs as a vicarious substitute for menstruation. Some authors have sought to establish a connection between recurrent epistaxis and pelvic disorders of the female; congestive turgidity of the turbinals is frequently noticed during menstruation, and impeded circulation may thus act as a primary factor in the nasal hæmorrhages.

Thirty-five cases observed in which there were connections between the nose and the generative organs and stomach. The author found turbinal hypertrophies, accompanied by dysmenorrhœa and gastralgia, and connected the latter trouble with the anterior third of the left middle turbinal, while the inferior turbinal and certain elevations on the septum appeared to be associated with painful menstruation. Cauterization of the appropriate intranasal region cured both gastralgia and dysmenorrhœa. Fleiss (*Wiener klin. Rundschau*, Nos. 1, 2, 3, 5, 8, 9, 10, '95).

An obstruction to the general circulation or any condition increasing the tension of the blood-vessels may give rise to epistaxis, while a weakened state of the

septal vessel-walls, which may be local through prolonged catarrhal inflammation, or general, through degeneration of the vessels at large as a result of disease or old age, may act as a primary cause. Disorders of the kidneys, liver, spleen, and other organs in which the blood undergoes organic changes may thus give rise to nose-bleed through mechanical impediment to its flow, and secondary engorgement of nasal blood-vessels.

There are three conditions which contribute to epistaxis in advanced nephritis: (1) interstitial nephritis, of the toxic kind, in arthritic subjects; (2) when there are alterations of the blood: anæmia or hydræmia; (3) modifications of the walls of the renal blood-vessels, which facilitate hæmorrhages and render them graver. M. H. Barth (*L'Union Méd.*, Aug. 30, '92).

Vascular degeneration regarded as the most prolific cause of epistaxis in the aged. Tautil (*Thèse de Paris*, '94).

In children nasal hæmorrhage is almost always the result of latent disease of the liver. In adults the hæmophilic form is generally associated with arthritism, and especially with the lesions of the liver caused by arthritic disease. Instead of tonics and milk diet, an alkaline and vegetable diet, with general and local douches, should be ordered. Verneuil (*Le Progrès Méd.*, June 2, '94).

Epistaxis may also be the result of obstruction to the return of blood to the heart through pressure upon the jugular veins by tumors, close-fitting neck-wear, etc., and through valvular disorders of the heart inducing vascular tension. A constitutional susceptibility to hæmorrhages exists in some persons, the bleeding being at the nose in the majority of cases; in these, the liability to epistaxis may be congenital.

In people beyond middle age the causes of epistaxis are: High arterial tension; sudden cardiac failure, either due to loss of power of the cardiac muscle or from the giving way of valve; overdistension of the whole venous sys-

tem; leakage following from an over-distended vein. That only a small proportion of persons suffering from circulatory diseases develop epistaxis is due to the fact that the relatively weakest point in them is probably in the venous sinuses of the nose. G. Coates (*Lancet*, Apr. 20, 1901).

Bleeding at the naso-pharynx and into the pharyngeal cavity is occasionally witnessed and sometimes gives rise to apprehension lest the hæmorrhage be from the lungs. Hence an examination of the naso-pharynx is always indicated when deciding as to the presence of phthisis, after hæmoptysis.

Although hæmorrhage from the vault of the pharynx, on a level with Luschka's bursa, is rare, the possibility of its origin from the pharyngeal vault should be remembered. Mounier (*La France Méd. et Paris Méd.*, May 6, '92).

Epistaxis occurs as a premonitory or concomitant symptom in a number of affections, such as typhoid and remittent fevers, scurvy, diphtheria, and the exanthemata. In plethora and when the cerebral circulation is overloaded, a free nose-bleed is generally productive of great relief.

Hæmorrhage from the nose due to cerebral congestion, especially in elderly people, must not be checked too quickly. It is a blessing in disguise, and may avert a cerebral hæmorrhage; but where the bleeding is excessive, any of the following expedients may be tried, viz.: spraying the nose with a 5-per-cent. solution of antipyrine, alum, tannic acid, or extract of suprarenal capsule. Donnellan (*Ther. Gaz.*, Mar. 15, 1900).

Pathology.—The profuseness with which the nasal mucous membrane is supplied with blood-vessels furnishes a ready explanation for the copious hæmorrhages which occur as a result of traumatism. A blow, by suddenly increasing the blood-pressure, readily causes rupture of one or several blood-vessels. The fact that arterial blood is generally lost indi-

cates that the venous sinuses are but seldom involved. Picking the nose, by denuding the membrane of its epithelium, especially over the septum, exposes the underlying membrane proper, tearing some of the numerous blood-vessels. The hæmorrhage sometimes originates in the posterior nasal cavity, especially in the mass of glandular tissue with which the vault is furnished.

Family form of recurring epistaxis, associated with telangiectasis of the skin and mucous membranes. Epistaxis has long been known to be associated with telangiectasis of the nasal mucous membrane, but it is very rare to find the dilatation of vessels involving the skin and other mucous membranes. A man of 52 was admitted for severe epistaxis, and it appeared that his father had had repeated attacks of melæna, while his mother and brother had suffered from severe epistaxis. The patient had first suffered from epistaxis at the age of twelve, and ever since had been liable to severe nose-bleeding, especially in the spring. It was found that numerous telangiectases were present on the skin of the nose, cheeks, and upper lip; similar dilatation of vessels was observed on the mucous surfaces of the lips, as well as on the tongue and soft palate. None was found in the mucous membrane of the nose. W. Osler (*Bull. Johns Hopkins Hosp.*, Nov., 1901).

Prognosis.—Epistaxis is rarely fatal, but danger is greatest in young subjects, especially those suffering from hereditary syphilis. Nurslings and the aged in debilitated health are also prone to a fatal form, owing to the friability of their vascular walls. In practically all cases of nose-bleed, however, the flow is soon arrested by appropriate measures.

Case of uncontrollable epistaxis resulting from a blow on the nose received during infancy reported, the blood flowing in a stream three or four hours and leaving the child pallid and dull. These attacks occurred about twice a month. If they did not occur for three or four

weeks he would become lethargic and sleepy. Remedies were of no avail. Chisolm (*Maryland Med. Jour.*, Dec. 24, '87).

Four instances of fatal epistaxis in nurslings less than a month old observed, which, to superficial observation, exhibited a typical picture of *melæna*. Two of the infants had hereditary syphilis, and at the autopsy were found to have nasal diphtheria. In the third child, the nasal bleeding complicated buccal hæmorrhage and purpura following purulent rhinitis consecutive to a bilateral blennorrhagic ophthalmia. At the autopsy there was found almost complete destruction of the nasal mucosa, laying bare the bone. In the last case the nasal hæmorrhage could be attributed to no definite cause. The mucosa was found to be simply congested and tumefied. Beneath the dura was found a clot covering almost the entire left hemisphere. In all these cases the bleeding had not appeared externally, but had passed by way of the nasopharynx into the stomach. Swoboda (*Wiener klin. Woch.*, No. 41, p. 916, '96).

Persistent and recurrent epistaxis is most frequently met with between the ages of 15 and 25 years. The bleedings are frequent and severe; they may occur on very slight provocation. The bleeding may be from one or both nostrils, or from the tear-duct. On irritation by means of a probe, of the membrane covering the cartilage of the affected side, blood will begin to ooze, at first very slowly, but ultimately with greater freedom. No other area inside the nose responds to irritation in this way, and the cartilaginous area in a patient with no history of epistaxis does not do so. The average size of the hæmorrhagic area is about equal to that of a silver three-penny piece. G. H. Mackenzie (*Scottish Med. and Surg. Jour.*, Oct., '97).

Case of epistaxis in most serious form necessitating ligation of the common carotid, followed by recovery. Max Thorner (*Nashville Jour. of Med. and Surg.*, Nov., '97).

Treatment.—The importance of the upright position in these cases is frequently overlooked. Gravity plays its

part here as well as elsewhere, and the mere change from the recumbent to the sitting posture is frequently sufficient to arrest the flow of blood. When there is great tendency to coma, however, the sitting posture should be tried, and if this cannot be endured, lying flat on the back is the next position.

The patient should always sit up before an open window,—never lie down. Ice may be used locally and to the back of the neck. The lower extremities should be immersed in hot water up to the knees, or the lower limbs bound with hot cloths, and small doses of digitalis with ergot may be given every three hours. Marmaduke Shield (*Clinical Jour.*, July 31, '95).

The hæmorrhage can frequently be arrested by simply closing tightly the bleeding nostril for a few minutes, especially when the flow arises from the anterior portion of the septum. Pressure upon the artery of the septum as it enters the nostril, or upon the branch of the facial, situated close to the alæ, will sometimes suffice. Raising the arms above the head to force the blood to mount against gravity, thus encouraging the formation of a clot, is also recommended. Among the simple measures recommended have been water, as hot as can be borne, glycerin, or lime-juice, either of which is to be injected into the bleeding nostril.

Irrigation with water as hot as can be borne suggested. Joal (*Revue Mens. de Laryn., d'Otol., et de Rhin.*, Feb., '88); Alvin (*La Semaine Méd.*, June 20, '88).

Certain repeated epistaxes, due to traumatic erosion on the antero-inferior aspect of the septum, are rapidly cured by filling the anterior nares with vaselin two or three times daily for two or three weeks. Ruault (*Arch. de Laryn., de Rhin., et des Mal. des Premières Voies Respir. et Digest.*, Dec., '89).

In habitual epistaxis a loose plug of absorbent cotton saturated with full-strength official solution of hydrogen

dioxide inserted into the bleeding cavity, supplemented by firm compression of the nose with the fingers, is an effectual means. E. L. Vansant (Phila. Polyclinic, Feb. 2, '95).

A simple method of controlling epistaxis is to fashion with a pair of scissors a dry plug of prepared sponge, in size and length comparable to the little finger of a 12-year-old boy. This should be carefully soaked in boiled water, to free it of grit, squeezed dry to free it of unnecessary fluid, and inserted its full length gently, along the floor of the bleeding nostril. No styptic is necessary. The expansive pressure of the soft sponge will check the bleeding at once. It should be removed in twelve hours. Cornick (Jour. Amer. Med. Assoc., Mar. 25, '99).

Apoplexy may result from plugging in epistaxis. A number of cases reported in which this has been the result, especially in the aged. In one case plugging with perchloride of iron produced erysipelas with very grave symptoms. Nasal hæmorrhage opening the vessels of the nasal mucous membrane lowers the threatened arterial hypertension, frequently relieving the vessels of the brain and conducing to the safety of the patient.

The treatment should not be begun by plugging the anterior and posterior orifices. In young persons with healthy arteries this might be permissible, but plugging the nasal fossæ in aged persons is dangerous. Perchloride of iron should never be used. Simple methods should be tried first, as pinching the nose, elevation of the arms, cold water, key down the back, etc. Afterwards small plugs steeped in a solution of antipyrin may be applied through the anterior nares, or the nasal passages may be irrigated with hot water. These methods will be sufficient to at least moderate the hæmorrhage, if not to arrest it. It is better in any case that the vessels open in the Scheiderian membrane than in the brain.

Dry cubbing in the lumbar region, purgatives, mustard footbaths, applications of hot water to the abdomen should all be resorted to before plugging. Landouzy (Medical Press, July 1, 1903).

Derivative treatment, such as hot footbaths, mustard plasters to the back of the neck, ankles, or chest, may also be employed, while stimulation of the vasomotors can be induced by the application of cold, in the form of ice, cold compresses, ice-bags over the nose, forehead, etc.

Flexible rubber tube, one end of which projects into a soft-rubber bag, recommended. The bag, being introduced into the nostril, is filled with water, the other end of the tube being then closed by means of a stop-cock. J. W. McCoy (Med. Record, Aug. 10, '89).

Immediate checking of violent hæmorrhage may sometimes be secured by Rose's epistaxis tampon, a thin gutta-percha, conical bag which can be inflated with air after it has been passed into the nose and the air retained by means of a stop-cock. H. Tilley (Clinical Journal, June 1, 1904).

When these simple means fail, the local application of styptics may be employed. Sniffing ice-water, into which a little salt has been dissolved, is sometimes very effective. Insufflations of tannic acid, gallic acid, or alum, either separate or combined, and antipyrine will arrest the bleeding in most of the severe cases.

Antipyrine produces a constriction of the vessels and of the tissues at the same time that it produces coagulation of the blood. It may be used in powder in solution, incorporated into gauze, or in ointment. For operations it may be used in a 5-per-cent. solution. Hénocque (Arch. de Laryn., de Rhin., et des Mal. des Prem. Voies Respir. et Digest., Apr., '88).

The styptic preparations of iron are preferred by some, but I have not found them more effective than the above, while their use is much more unpleasant to both patient and physician. Solutions of sulphate of zinc, acetate of lead, or sulphate of copper (30 grains to 1 drachm) may be applied with a syringe

or with the atomizer. Cauterization of the bleeding spot has been recommended, but the necessary instruments are seldom at hand. The same is the case with electrolysis.

Cautery-point to be applied in cases due to traumatic erosion on antero-inferior aspect of septum. F. H. Potter (Jour. Amer. Med. Assoc., Sept. 27, '90).

Cauterization of bleeding spots with crystalline chromic acid recommended. Pogorelsky (Medycyna, No. 51, '91).

Three-per-cent. solution of trichloroacetic acid in persistent epistaxis recommended as a substitute for the chloride of iron. It may be applied on cotton wrapped around a probe. The intense burning sensation which it causes may be overcome by the addition of a 20-per-cent. cocaine solution. Cozzolino (Wratch, No. 82, '94).

Treatment may be local or general. A solution of cocaine is applied to the anterior septum, and the part is then subjected to linear cauterization with the electrocautery. An almost equally good result may be produced with chromic acid or solid nitrate of silver. G. H. Mackenzie (Scottish Med. and Surg. Jour., Oct., '97).

In connection with the treatment, blowing of the nose should be avoided for some time, so as not to remove the clots which arrest the bleeding mechanically.

When evidences of weakness become apparent, such as pallor, vertigo, etc., mechanical means must be resorted to. The simplest of these is to pack the bleeding cavity with pledgets of cotton, lint, or bits of sponge, previously dipped in some styptic solution, and of sufficient size to exert pressure when in place. Any blunt instrument may be used to mass them in, one after the other. They can be withdrawn with dressing-forceps after twenty-four hours, and new ones replaced if necessary. R. J. Levis used small pieces of sponge passed successively over a piece of twine.

An effective method is to employ 15 long threads of patent lint, $3\frac{1}{2}$, or 4 inches long; these are doubled on themselves and tied in the middle by a string, one end of which is left 6 or 8 inches long, for ease in extraction. The bundle of threads is passed back into the posterior nares by a probe and left there; the probe is withdrawn and the anterior nares plugged. These 20 or 30 ends floating in the blood at once coagulate it. W. W. Parker (Med. Record, Oct. 4, '90).

A piece of old, soft, thin cotton, about six inches square, by means of a probe is pushed, "umbrella" fashion, into the nostril, the direction of pressure, when the patient is sitting erect, being backward and slightly downward. It is pushed on until it is felt that the point of the "umbrella" is well into the cavity of the naso-pharynx.

A considerable quantity of cotton-wool is pushed well back to the bottom of the sac in the pharynx. Then, the probe being held well against the packed wool, the mouth of the sac is pulled upon, and thus its bottom is drawn forward and forms a firm, hard plug, wedged into the posterior nares. The sac may now be packed full of cotton-wool. The mouth of the sac is tied just outside the nostril, trimmed with scissors, and the ends of the thread secured outside.

In removing the plug, gently remove the cotton-wool bit by bit, then gently pull out the sac, or if adhering apply a little warm water. A. A. Philip (Brit. Med. Jour., July 18, '91).

Suprarenal extract successfully used in a case of persistent intermittent epistaxis of long standing in a boy of 6, following diphtheria. On examination of the nasal cavities the only abnormality found was a dilated and angiomatous condition of the vessels. Pledgets of cotton-wool saturated with a 5-per-cent. solution of cocaine were introduced into each nostril and left *in situ* for five minutes. On withdrawal of these, similar pledgets soaked in a saturated solution of boric acid, containing 5 grains of adrenal extract to the ounce, were inserted and left for the same time. The

applications were made on alternate days for three weeks, then every fourth day for three weeks more. The immediate effect upon the mucous membrane was to produce a condition of ischæmia, and the epistaxis ceased altogether. Lermite (Brit. Med. Jour., Feb. 25, '99).

Four cases of severe epistaxis met with in which the bleeding arose from the upper and anterior part of the nasal cavity, coming probably from the ethmoidal veins. Bleeding can be easily checked by firmly packing gauze between the septum and the anterior half of the middle turbinate bone. The parts below may be left free so that nasal respiration is not impeded. A. B. Kelly (Lancet, Feb. 24, 1900).

In some cases, the point of origin of the hæmorrhage is so far back that anterior packing is not sufficient. Resort must be had to posterior tamponing, a rather difficult procedure in most cases. Bellocq's cannula, an instrument especially adapted for the purpose, was formerly used, but its drawbacks and the fact that it was seldom obtainable has caused its practical abandonment. Any of the packing methods already described can be employed as advantageously if care is taken that the substances used—cotton, lint, sponge, or thread—be in sufficient quantity to completely occlude the post-nasal opening. If left in place too long, tampons may cause suppuration of the middle ear; they should, therefore, be changed after twenty-four hours, or, at most, forty-eight hours.

Case of otorrhœa occurring as a result of the continued presence of a tampon introduced and left *in situ* by a hospital nurse for six days. Chatellier believes that the application of anterior plug is adequate. Natier (Revue Méd., Aug. 7, '92):

In many cases suppurations of the middle ear are liable to occur after plugging. Gellé (Archives Inter. de Laryn., de Rhin., et d'Otol., No. 3, '92).

Plugging the nasal cavity with a Bellocq sound often gives rise to dan-

gerous sequelæ. The pledgets cannot be left long in position, and their extraction is very prone to start bleeding afresh. J. G. Macnamara (North-western Lancet; Western Med. Reporter, Mar., '95).

As the hæmorrhages nearly always arise from the anterior portion of the nasal cavity, there is no necessity of tamponing far back. Lermoyez (Med. and Surg. Reporter, Apr. 6, '95).

Several cases reported of epistaxis through the eyes, following nasal plugging. Editorial (Medical News, Dec. 21, '95).

In cases of recurrent epistaxis, the likelihood of organic cardiac lesions, or of hepatic, pelvic, or renal disorders should be borne in mind, and appropriate measures instituted if need be. In such cases treatment of the nasal mucous membrane proves inadequate, especially when the vascular tension is marked.

The value of adrenal extractives in arresting epistaxis is now generally recognized, but cases of secondary hæmorrhage frequently follow its use.

Instance of very alarming epistaxis in which all ordinary methods of stopping the hæmorrhage were tried without success, and the patient was reaching a dangerous condition when adrenalin in a strong solution was used with most happy results. There was no further bleeding either immediately or secondarily. J. P. Booth (Southern Calif. Pract., July, 1902).

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ERGOT.—Ergot, popularly known as spurred rye, is the sclerotium of a fungus (the *Claviceps purpurea*) which attacks and finally supplants the grain in the common rye (the *Secale cereale*). It presents itself in grains of a slightly-curved, fusiform shape, which are brittle, yet moderately flexible. It has a disagreeable, fishy odor, and a somewhat bitter, acrid taste. Ecboic acid, ergotic acid, sclerotinic acid, ergotine and er-

gotinine, and ecboline have been isolated by chemists who have claimed each to be the active principle.

The efficient principle of ergot is largely chrysotoxin, and sphacelotoxin is most advantageous of all the preparations. In subcutaneous administration the dose is from $\frac{1}{100}$ to $\frac{1}{10}$ drachm, which produces prompt uterine contractions. The remedy has little effect upon the general condition of the patient. The hypodermic use of ergot is much superior to the administration of ordinary preparations by the mouth. Palm (Monats. f. Geburts. und Gynäk., Bd. xvi, H. 5, 1902).

Ergone a new preparation. No attempt was made to isolate the so-called active principle of ergot, but only to secure as many of the active substances and to reject the irritating and depressing principles. This was accomplished by percolating the drug with various menstrua and throwing out by precipitants the undesirable portions. Each step of the process was controlled by testing the precipitates or filtrates by administering them to cocks and observing the blackening of the combs; also by injecting hypodermically into guinea-pigs and studying the abortifacient action. The product was a clear, amber-colored fluid, representing one part by weight of the crude drug; this was combined with chloretone as a preservative. Ergone was found to have all of the physiological properties of ergot, and not to have any unpleasant action upon the stomach, nor to cause irritation when injected beneath the skin. E. M. Houghton (Therap. Gaz., July 15, 1903).

Ergot also contains ergotinic acid, sphacelinic acid, and cornutin. The virtues of the latter two ingredients, however, are lost by long keeping.

Solution of ergotine can be preserved antiseptic for at least five days, if a few drops of carbolic acid be previously added to the solution. Aufrecht (Ther. Monats., May, '91).

Ergotinol considered preferable to other preparations of ergotine on ac-

count of the ready adjustment of its doses, its prompt action, and particularly its keeping qualities. No unpleasant effects observed. Abel (Berl. klin. Woch. No. 8, '97; Deut. med.-Zeit., July 29, '97).

Kobert believes cornutin to be a true alkaloid and teaches that the chief activity of the drug is dependent upon it and the sphacelinic acid. Tanret, however, denies the existence of cornutin as an alkaloid.

Preparations and Dose.—Ergot, 15 to 30 grains.

Extract of ergot (solid extract), 5 to 20 grains.

Extract of ergot (fluid), $\frac{1}{2}$ to 1 drachm.

Wine of ergot, 2 to 4 drachms.

SUBCUTANEOUSLY.—Bonjean's ergotine (Fr. Cod.) and Squibb's ergotine are especially prepared for hypodermic use, 5 parts being dissolved in 7 parts each of glycerin and water and then filtered, 3 to 12 grains (representing 120 grains of crude ergot) of the ergotine being the proper dose.

Physiological Action.—In very small doses no appreciable effects are produced except in labor. In therapeutic doses its principal action is upon unstriated muscular fibre, producing a contraction of the blood-vessels, especially those of the spinal cord, dilatation of the pupils, and contraction of the uterus.

As it is a powerful stimulant of the vasomotor nerve-centres, it causes tonic spasm of the muscular coats of the blood-vessels accompanied by a rise of arterial pressure and a slowing of the heart-beat. This rise of arterial tension is preceded by a fall which is due to the depressant action of the drug in direct contact with the heart-muscle, and, if the dose be very large, the fall of pressure is never recovered from and progressive paralysis of the vasomotor apparatus and heart oc-

curs (Hare). Hemmeter believes that the uterine contractions produced by ergot are produced by stimulating the centres in the lumbar portion of the spinal cord which control this viscus. It has heretofore been accepted that the contraction was due to its direct action upon the unstriated muscular fibres of the organ. Both theories are probably true.

Ergot produces no vascular contractions, but acts directly on the peripheral uterine ganglia. It has no direct action upon the blood-pressure, and must, therefore, have a specific action on the blood, which is thus more readily clotted at susceptible points in the vascular system. Ellinger (Sanitary Inspector, July 4, '91).

Under full doses of ergot the respiratory movements are slowed, intestinal peristalsis is stimulated, and the secretion of urine is increased. The toxic effects, in man, are seldom produced save by large and long-continued doses.

The action of ergot usually begins within fifteen minutes after its ingestion, and attains its maximum intensity in thirty minutes. Its effects last for an hour, when the dose must be repeated if its continued action is desired.

Poisoning by Ergot (Ergotism; Acute Poisoning).—Very large doses of ergot produce symptoms of gastro-intestinal and cerebro-spinal origin. When taken by mouth ergot produces a heat and dryness of the throat, thirst; gastric pain, with nausea or vomiting; intestinal colic and diarrhœa, giddiness, headache, restlessness and even delirium, coldness of the surface of the body, dilatation of the pupils, and a great retardation and slight weakness of the pulse.

Case of a man who had difficulty in breathing in the morning. The pupils were dilated, and the power of accommodation almost completely lost. It was then found that he had been taking

extract of ergot. The patient was, therefore, given a vigorous diet, the ergot stopped, and he soon recovered. Schneider (Münchener med. Wochen., Sept. 30, 1902).

CHRONIC POISONING.—When ergot is used for a long time as food (bread made from diseased grain) chronic poisoning occurs which may assume two forms, the convulsive and the gangrenous, which are well described by Bartholow:—

The convulsive form begins by vertigo, disorders of vision, tinnitus aurium, numbness of the fingers and toes, and afterward of the integuments. These symptoms are followed by spasmodic contractions of the muscles, opisthotonos or emprosthotonos supervening. Complete anæsthesia after superficial follows, and gangrene may occur. The organs of sense are blunted. The pupils are dilated; sometimes unequal and various disturbances of vision ensue. Epileptiform convulsions may occur in addition to the tetanoid spasms; delirium appears, followed by complete insensibility.

Between the latter part of 1889 and autumn of 1890, in the State of Wjatka, 2749 people suffered from ergot poisoning, 535 cases of which proved fatal. Convulsions were observed in all cases; no gangrene was noticed. In 7 cases the liver, spleen, and kidneys were examined microscopically. The spleen showed the following changes: The connective-tissue frame-work strongly marked, the pulp hyperæmic, the Malpighian bodies distinctly marked, a few greatly enlarged and hyperplastic, others appear in the centre as a uniform layer with no nuclei. The arterial walls, particularly the central vessels of the Malpighian bodies, are thickened, glossy, and show hyaline degeneration. The liver is hyperæmic, the liver-cells atrophied, the nucleus either lost or the staining unsatisfactory; the arterial wall had the same changes as in the spleen, the lumen at times entirely obliterated, results of coagulation-necrosis of the liver-cells. In the kidneys the changes prevail in

the cortex-substance, hyperæmia of the glomeruli, formation of a uniform mass in Bowman's capsule, with consecutive compression and changes of the glomeruli, glossy-looking changes in the blood-vessels, with coagulation-necrosis of the epithelium of urinary tubules. N. Winogradov (Wratch, Nos. 21, 23, '95).

The gangrenous form is ushered in by a tingling numbness, formication, fatigue, earthy hue of the skin, coldness of the surface; nausea, vomiting, and diarrhœa, with intestinal colic, follow. Muscular contractions take place, an eruption of vesicles filled with a dark, ichorous fluid appears on the extremities, and gangrene, dry or moist, sets in. Bartholow refers the phenomena to two causes: to the dyscrasia which exists in the subject of this malady referable to insufficient food and bad hygienic surroundings, and to the action of the ergot in diminishing the blood-supply to the cerebro-spinal axis, to the vegetative organs, and to the skin and muscular system.

Treatment of Poisoning by Ergot.—In cases of acute poisoning the bowels should be opened by quick purgatives: by castor-oil or Epsom salts. Tannic or gallic acid should be given internally. The recumbent posture should be maintained, the patient be stimulated with brandy or other spirits, and given amyl-nitrite by inhalation.

Therapeutics.—The therapeutic value of ergot depends upon its characteristic action on unstriated muscular fibre and its influence on the sympathetic system. It is mostly used by obstetricians and gynecologists to cause uterine contraction. Its action on the non-pregnant normal uterus is slight and uncertain, and increases in certainty and efficiency as the womb increases in size. Its use as an oxytocic is not generally sanctioned by the authorities.

LABOR.—Full doses of ergot are never to be given to hasten the delivery of a fœtus, because it causes tonic contraction of the uterus, interruption of the placental circulation, endangering the child through asphyxia, and should operative procedures be necessary they are greatly embarrassed by the rigidity of the uterus, and the danger of the uterine rupture is increased.

Ergot given prior to delivery produces a frightful mortality among infants, and is the most frequent cause of retention of the placenta, as well as of other abnormal conditions. It is never necessary except hypodermically in dangerous post-partum hæmorrhage in rare cases. Hyde (Amer. Med. Digest, Apr. 15, '88).

Ergot injections found invaluable in external hæmorrhage due to uterine inertia in labor. Ch. Liégeois (Revue Gén. de Clin et de Thér. Jour. des Prat., June 22, '95).

The conditions and circumstances under which ergot may be employed in obstetrics are (1) that the presentation may be natural or cranial, except in some instances of breech presentation, in which it may be necessary to deal at once with uterine inertia; (2) that there should be no marked disproportion between the fœtus and mother, or any other physical impediment in the genital tract to delivery; (3) that the os uteri, if not previously fully dilated, should be so dilatable as to allow speedy extraction by the forceps when necessary; and (4) that the preparation selected, the dose, and the method in which it is employed, should be well calculated to produce the required effect.

Many varied disorders which have been regarded from the purely nervous standpoint are due to circulatory disturbances around and about those nervous structures. The indications do not call for nerve tonics and stimulants, but for means that tend to equalize and tone the circulation. Ergot seems to fulfill the latter requirements most satisfactorily. The writer has used it with success in insomnia, headaches (especially congestive), eye and ear disorders, and

pain in general. Morphine and opium poisoning and drug habits were also benefited, as were delirium tremens, hysterio-epilepsy, chorea, paresis. It is also recommended in acute inflammatory and zymotic diseases, in typhoid, in angina pectoris, as a preliminary to operation, and in shock. The effect in all these is directed to abnormally dilated blood-vessels. The precautions to be used are the hermetically sealed aseptic bottles or the author's solution which consists of one drachm of Squibb's extract of ergot dissolved in one ounce of formalin solution ($\frac{1}{3000}$). The dose by hypodermic injection, preferably into the deltoid muscle, is from 15 to 30 minims, repeated in a half hour, if necessary. The writer has seen ergotism occur in very rare cases only. A. T. Livingstone (Jour. Amer. Med. Assoc., Mar. 21, 1903).

Small doses, 10 minims of the fluid extract repeated hourly, as suggested by Wood, may serve to intensify the pains of a slow labor or incite them in uterine inertia. Instrumental delivery, however, is generally preferred to the use of ergot. The proper time for the exhibition of ergot is generally conceded to be at the end of the third stage—after the delivery of the child and the placenta—when it aids in producing a firm, lasting contraction of the uterus. It is especially indicated if an anæsthetic has been required to effect delivery. It is useful as a prophylactic against, and a remedy for, post-partem hæmorrhage.

Cornutin in inertia uteri, during parturition, cannot be recommended as effectual. It is of especial value in atonic post-partum hæmorrhage, and in the hæmorrhage following an abortion. It also acts promptly in the metrorrhagia and menorrhagia that occur in consequence of endometritis, metritis, or other diseases of the uterus or its adnexa, and can be given hypodermically in doses of $\frac{1}{32}$ to $\frac{1}{10}$ grain, or $\frac{1}{16}$ to $\frac{1}{8}$ grain, internally. A solution usually gets milky in from eight to fourteen days, and it is then useless. In-

jurious effects never noticed. H. Thompson (Centralb. f. Gynäk., Mar. 16, '89).

Cornutin has not proved reliable in a number of cases where it was used to control uterine hæmorrhages due to atony of the muscles after confinement, and in other gynæcological troubles. The effect of ergotine is persistent, and in every way is superior to cornutin. Editorial (Wiener klin. Woch., Nos. 22 and 23, '95).

ABORTIONS.—Ergot is here useful if the uterus remains relaxed, but is contraindicated before the uterus has been emptied. It is useful in the subinvolution consequent upon abortions, given continually in small doses.

HÆMORRHAGE.—Ergot is used in hæmorrhagia dependent upon the presence of fibroids or other neoplasms. It was used formerly to cause shrinkage of uterine fibroids, but surgical methods are now more in favor.

In the treatment of uterine fibroids by the injection of fresh, pure solutions of ergotine the needle should be inserted for not more than $\frac{1}{8}$ to $\frac{1}{4}$ of an inch into the anterior or posterior lip, but never into the body of the uterus or into the tumor itself. Schücking (Centralb. f. Gynäk., Feb. 25, '88).

Indications for ergotinol are the same as for ergot. Maximum dose used, 30 minims daily. In case of fibroma with excessive menorrhagia, one injection daily for eight days during the menstrual epoch given with excellent results. M. Abel (Med. and Surg. Reporter, June 5, '97).

In pulmonary hæmorrhage its use is not advised, because of the increased vascular tension which it produces. For the same reason it is not advised in cerebral apoplexy. On other forms of hæmorrhage, however, it is a valuable hæmostatic: in epistaxis, in hæmaturia (renal or vesical), in purpura hæmorrhagica, the hæmorrhage of scurvy, etc. It has been used also in the intestinal hæmorrhage of typhoid, in dysentery

with bloody stools, in serous diarrhœa, and in bleeding hæmorrhoids.

DIABETES.—The use of ergot combined with the bromide of sodium is advised by Hare in the treatment of diabetes insipidus.

GENITAL DISORDERS.—Ergot has been employed with good effect in spermatorrhœa and in deficient tone of the genital organs.

Citrate of cornutin recommended in the treatment of spermatorrhœa. Doses of $\frac{1}{20}$ to $\frac{1}{10}$ grain. The remedy is always well borne, even when continued for several months. It is especially valuable in the paralytic form of the disease, but fails in the spasmodic form, such as that which succeeds inflammation of the seminal vesicles or vas deferens. Bókai (Medizinisch-chirurgisches Rundschau, No. 9, '93).

Citrate of cornutin in its action on the uterine tissues has given good results in daily doses of $\frac{1}{2}$ grain, taken in three doses, in urethral hæmorrhage, and also vesical and uterine. Citrate of cornutin has produced cures in divers cases of paralytic spermatorrhœa. It acts in these cases by diminishing the medullary irritability, and particularly that of the genito-spinal centre. A. Meisel (La Méd. Mod., Mar. 23, '95).

Hypodermic injections about the dorsal vein of the penis are useful in impotence when the trouble is due to its emptying too soon. It is used in enlarged prostate with retention of urine and in enuresis.

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ERYSIPELAS.

Definition.—By erysipelas is meant a violent inflammation of the superficial lymph-channels.

Symptoms.—Erysipelas is most frequently found about the face and head, probably because of the excessive number of superficial lymphatic vessels. The affection has gradually lessened

through the use of antiseptic principles in surgical practice.

Case of erysipelas manifesting itself first in the fauces and tongue and extending painlessly up the Eustachian tube to the face. On three separate occasions the disease started from the same site—i.e., the neighborhood of the left ear—and spread all over the face, and was complicated by infective endocarditis. Magill (Lancet, Feb. 19, '98).

True cutaneous erysipelas is characterized by severe elevation of temperature, attended by a disseminated inflammation of the skin. This is sometimes preceded by a chill. The elevation of temperature continues until the erysipelatous process reaches its end. There may be a wound from which the redness starts, or there may be no cutaneous evidence of the seat of infection. A mere scratch, though healed, may have allowed the streptococcus to enter; having traveled up the lymphatics, the organism starts the erysipelatous process at a distance from the seat of entrance. There may be red streaks showing lymphatic glands extending from the wound to the special place where the poison now develops very freely.

The lesions in erysipelas of the newborn are nearly the same as in adults, the skin and the subcutaneous layer being almost normal. Morel (Revue Mensuelle des Mal. de l'Enfance, Mar., '91).

Erysipelas in the newborn may develop not only about the umbilical wound, but also around a vaccination-wound and around the conjunctiva. Histological examination shows accumulations of streptococci in the lymphatic vessels. There may be a few bacilli in the superficial region of the derma, but none in the epidermis. At first the fever is not excessive, and it may not be noteworthy until the second or third day. If the child do not quickly die there may be several resulting abscesses, and death may ensue from the fifteenth to the twentieth day. If recovery take place it may be long in coming, being delayed

by athrepsia or infectious diarrhœa. Lemaire (*Revue des Sci. Méd. en France et à l'Étranger*, Jan. 15, '94).

Erysipelas of the face and head following otitis observed seven times within a period of six months. Hessler (*Le Bull. Méd.*, July 7, '95).

In 100 cases of erysipelas just one-half were clearly traceable to pre-existing skin lesion. Charles W. Allen (*Med. Record*, Nov. 23, '95).

In some places in Nevada erysipelas is epidemic, and there is a considerable difference in the virulence of the disease. Furley (*Kansas City Med. Record*, Jan., '96).

Tension of the cellular tissues now becomes very marked; blebs may form on the surface from the intense irritation of the papillary layer of the skin. It sometimes happens that the process, having started in one part of the body, may be arrested, only to manifest itself elsewhere. As a rule, after the process subsides the parts are soon restored to their normal condition, although a certain amount of desquamation takes place.

When the deeper lymphatics are affected a great deal of effusion takes place in the cellular tissue, and cellulitis results, which is much more intense than that described as arising from the streptococcus in its ordinary degree of virulence. It bears, however, a great analogy to it, only the symptoms may be much more intense. A suppurative process takes place with a great disintegration of cellular tissue. This has been characterized as phlegmonous, or suppurative, erysipelas. It may come to the surface, and subsequently change its course as an erysipelas of the skin. It is also possible that other bacteria should contaminate this infection.

The constitutional symptoms correspond to the intensity and extent of the local process. The temperature rises to about 104° F., and may reach 107° F. The fever may be of a continuous remit-

tent or intermittent type, and is in direct proportion to the extent of the inflammation. There may be gastric symptoms, loss of appetite, nausea, vomiting, excessive thirst, and a highly-coated tongue. The urine is generally dark colored, and may contain albumin, blood, bile-pigment, and micrococci. The spleen is sometimes swelled, and there may be pain in the region of the kidneys. If the process be not arrested, death may result from the extension of the local infection to some vital organ, as the brain or peritoneum.

Suppurative arthritis of the knee following erysipelas observed, in which was found Fehleisen's streptococcus. Schreiber (*Bolnitchnaja gazeta Botkina*, No. 2, '91).

Case considered as one of infective pneumonia, due to extension of an erysipelas of the pharynx down the bronchial tract to the parenchyma. Collins (*Il Morgagni*, Aug. 29, Oct. 15, '91).

In the majority of cases erysipelas does not cause abortion. If confinement or miscarriage occur during its course, there is no genital infection, provided obstetrical antisepsis be rigorously practiced; moreover, the children at birth show no trace of erysipelas. Le Gendre (*Gaz. des Hôpitaux*, Dec. 23, '92).

Two cases of blindness from facial erysipelas observed. Snell (*Ophthalmic Review*, May, '93).

Synovitis or suppurative arthritis may occur as a complication of erysipelas. In 817 cases of erysipelas one or the other of these conditions took place. The complication may arise at any time during the attack. The suppurative form requires the promptest and most heroic treatment. Disorganization of the joint will follow, even the death of the patient, otherwise. Gamgee (*Birmingham Med. Rev.*, vol. xxxviii, No. 205, '95).

Following after a relapse of erysipelas, in a young woman of 22 years, there developed peculiar black abscesses and furuncles. In the course of a year and a quarter about 650 of these were noted,

affecting all parts of the body, including the hairy scalp. Fever, up to 100 degrees and more, but without distinct relation to the abscess-formation, was observed. There was little depression of the general health, and the termination was complete cure. The abscesses were confined to the skin and subcutaneous tissues, and varied in size from that of a millet-seed to that of a large nut, and were marked by formation of gas in their centre and by the dark pigmentation. Bacteriological examination showed streptococci and indefinite cocci and bacilli. Zeller and Arnold (*Virchow's Archiv*, vol. cxxxix, H. 2).

Leucin and tyrosin demonstrated both microscopically and chemically in the urine of a girl, 18 years old, who was passing through an attack of facial erysipelas. Kirkbride (*Centralb. f. innere Med.*, No. 41, p. 1057, '97).

The kidneys are affected in about 38 per cent. of all cases of erysipelas. This is evidenced in the kidneys by the presence of casts with or without albumin, of albumin with or without casts, or of both. The presence of even large quantities of albumin with renal elements in the sediment may be only transitory, and does not necessarily imply an unfavorable prognosis. Robert Pollatschek (*Zentralbl. f. Innere Med.*, May 16, 1903).

Death may also result from exhaustion consequent upon the febrile process and weakening of the organs by gradual infection.

The duration of the infection is very uncertain. It may seem to have disappeared, and subsequently starts up again. It may last a few hours, and continue for several weeks. Again, it may travel over the whole body and possibly attack the same locality several times. As a rule, it delineates its course within two or three weeks.

Examination of the blood, whether made during an attack or during the period of convalescence, furnishes valuable information regarding the course of an attack of erysipelas. The curve of the number of leucocytes in a case of

erysipelas follows very closely that of the temperature, but this leucocytosis does not show equally throughout the various blood-elements. The polynucleated cells show an increase as soon as the malady is established, while at the same time the number of mononucleated cells diminish, such diminution occurring chiefly in the lymphocytes. When recovery takes place it is signalized by a fall in the number of polynucleated cells. The eosinophile-cells, which fell in number during the course of the illness, only appear again when the blood-infection is altogether at an end. Chantemesse (*Lancet*, Mar. 11, '99).

Some persons are subject to "habitual attacks" of erysipelas, generally about the face and probably repeated infections from a chronic nasal catarrh.

Study of 810 cases. A direct relation found between menstruation and erysipelas in only 5.2 per cent. In 1.62 per cent. menstruation could be regarded as a direct etiological factor. In 57 cases of recurrent erysipelas only 3 were due to menstruation. Erysipelas has no appreciable influence on the duration and amount of the flow. On the contrary, menstruation favors the development of erysipelas through its influence on the nervous system. Recurrences during the flow are due to the peculiar nervous state of the patient and to the persistence of colonies of streptococci in the skin and lymph-spaces, whose virulence has not been entirely destroyed. Salvy (*Gaz. Hebdom. de Méd. et de Chir.*, No. 40, '96).

In most instances spontaneous recurrent erysipelas of the face develops from the nasal fossæ through the lacrymal duct or the nostrils. The point of departure is either in the nasal fossæ or, more frequently, in the more or less hypertrophied adenoid tissue of the pharyngeal cavity. The preventive and also the curative treatment of recurrent erysipelas of the face consists in taking care of the nasal and naso-pharyngeal cavities, but especially in reducing the adenoid tissue in the pharyngeal vault, which the surgeon must remove even from between the Eustachian cushions.

H. Lavrand (*Revue Hebdomadaire de Lar., d'Otol., et de Rhin.*, Sept. 5, '96).

In the production of facial erysipelas chronic nasal affections play an important rôle; hence the frequency with which erysipelas starts from the centre of the face, the orifice of the nostril being a favorite point of departure. F. de Havilland Hall (*Lancet*, Feb. 6, '97).

In 100 cases a local abrasion accounted for the entrance of the organisms in the majority; in erysipelas of the face the nasal mucous membrane was very often found to be in an unhealthy condition, while in other cases the throat was evidently the channel of infection. Allen (*Med. News*, Apr. 8, '99).

Certain attacks of erysipelas have proved a source of immunity against anthrax, at least for a few days. There is a growing opinion that it exercises a direct effect against the development of sarcoma. Indeed, cases are reported of sarcomatous growths having gradually disappeared after an attack of purulent erysipelas; hence the practice of inoculating erysipelas in those suffering with inoperable sarcoma. This procedure is not, however, without danger to the patient, for it is not always possible to limit the development of the disease; hence the patient should be made cognizant of the risk to be run by the inoculation of erysipelas for the destruction of sarcoma.

Anthrax immunity lasts only so long as the erysipelas cocci remain in the body, and that after ten to fourteen days the susceptibility to anthrax poisoning is as great as before. A too powerful injection of erysipelas cocci may cause death as certainly as would the anthrax poison. Mattei (*Bull. Gén. de Thérap.*, Nov. 15, '88).

Cases summarized where erysipelas has been artificially excited to cure (1) five sarcomas: three cured, two relapsed; (2) six doubtful cases (sarcoma or carcinoma): failure; (3) three ulcerative epitheliomas: failure; (4) two cicatricial keloids and "several" lympho-

mas: cure. Bruns (*Centralb. f. Chir.*, p. 620, '88).

Case of a woman in whom ulcerous syphilides of the face were cured by an attack of erysipelas of the face. Lop (*Marseille-méd.*, Mar. 15, '92).

When a syphilitic exanthem is unaccompanied by malignity or cachexia, a febrile erysipelas intervening is favorable. Ricard and Dupré, Lamarche, and Mauriac (*Thèse de Paris*, '56); Lop (*Marseille-méd.*, Mar. 15, '92).

Case of advanced leprosy of the conjunctiva which was much ameliorated by an attack of erysipelas, the leprous nodules disappearing entirely from the conjunctiva, but recurring six months later. Terson (*Société d'Ophthal. de Paris*, Apr. 14, '96).

The danger to the patient from effect of erysipelas toxins upon malignant growths is great. The alleged successes are so few and doubtful in character that the most that can be fairly alleged for the treatment by toxins is that it may offer a very slight chance of amelioration. Valuable time has often been lost in operable cases by postponing operation for the sake of giving the method of treatment a trial, and, if the method is to be resorted to at all, it should be confined to the absolutely inoperable cases. L. A. Stimson, A. G. Gerster, and B. F. Curtis (*Annals of Surgery*, July, '96).

Erysipelas can bring about improvement and even a lasting cure of lupus. One of the best chances of cure for a lupoid patient is to contract erysipelas. It may be advisable to practice inoculations with it, when we shall be in possession of a method of treatment capable of checking its progress at the right time if it happens to assume a dangerous character. Hallopeau and G. Bureau (*Bull. de la Soc. Franç. de Derm. et de Syph.*, June, '96).

Actual extension of erysipelas from one patient to another can usually be traced. The scales of loose epidermis, or epidermis cut from an affected area, the sweat, and even the contents of blebs, as long as they are not purulent, are found to be free from streptococci. In-

fection proceeds from the discharge of erysipelatous wounds, and these should be treated as other infected wounds, but the patient should not be handled as though he were suffering from a contagious disease. W. Respingier (Beit. z. klin. Chir., vol. xxvi, p. 261, 1900).

The diagnosis of ordinary erysipelas is very simple. Gradually increasing and spreading redness is characteristic, and it can only be mistaken for ERYTHEMA. This latter infection, however, is not accompanied by fever, while erysipelas always is.

Complications.—The wound may apparently not be interfered with in the healing process, while at the same time a deep cellulitis exists, and may finally end in suppuration. The open wound upon which erysipelas has developed will take a dry, gray, dirty, and glossy appearance, covered with a sort of croupous membrane, and will retain this appearance until the intensity of the infection has disappeared. On the mucous membrane a swelled condition takes place, which may also cover itself with a croupous membrane. There may be marked disturbances of the central nervous system as the result of a high fever. Delirium and stupor, accompanied by vomiting and convulsions, may follow. A collapsed condition of the system may take place after the disappearance of the symptoms. Hallucinations and certain motor disturbances may occur. As a rule, the lymphatic glands are not affected in superficial erysipelas, while they may suppurate in a deeper form of the infection. Internal complications known as metastatic inflammations may take place. These may be septic bronchitis, pneumonia, or meningitis, while peritonitis may follow erysipelas of the neighboring parts. The local sequelæ of erysipelas are a thickened condition of

the cellular tissue due to the obstruction of the lymphatic vessels and an impaired condition of the vitality of the skin, predisposing the parts to eczematous ulcerations. Deep cicatrices may also form as a permanent result.

Etiology and Pathology.—Erysipelas is a violent inflammation of the lymph-channels, caused by the streptococcus. Although it is now generally conceded that the infectious agent, as described by Fehleisen as the cause of erysipelas, is identical with the streptococcus of suppuration, the symptoms of erysipelas are sufficiently different to warrant a description of this infection as a form of affection separate from ordinary suppuration. It has been proved that the virulence of the streptococcus varies materially with the nature of the soil upon which it grows; that it will frequently acquire a greater virulence when the resistance of the subject is lessened, as in tuberculosis, diphtheria, scarlet fever, small-pox, typhoid fever, and influenza, and when the vitality of the body is materially reduced, as by overwork. Its virulence materially differs in various animal organisms, as it is by no means equal to the virulence of the same streptococcus in mice or rabbits. Erysipelas can be produced in rabbits by the injection of the ordinary streptococcus of suppuration, and by that means acquire a greater virulence, and, if not attenuated, would reproduce symptoms of erysipelas in an ordinary wound infected with it. From its etiology, therefore, erysipelas is a non-specific disease, but is due to a higher state of virulence which the streptococcus happens to possess at the time it enters the tissues, or which it can soon acquire when the tissues are suited to its development in a virulent shape. It has also been demonstrated that erysipelas cocci may enter

the blood; but, as a rule, they are not found in this fluid.

Series of 11 personal cases of erysipelas in which some of the patients presented a previous rheumatic history, while others exhibited manifestations of the arthritic diathesis, either personally or in their ancestry, and still others were neither rheumatic nor arthritic. In the latter it was thought that the erysipelas was responsible for the development of rheumatism.

This acute polyarthritis following erysipelas usually sets in during convalescence, as desquamation is taking place, from a day to a week after defervescence. The temperature rises again, the pulse is accelerated, and various joints become successively painful, red, and swollen. Characteristic acid sweats take place, and cardiac complications may occur. The salicylates afford speedy relief. Editorial (*Medicine*, Apr., '99).

Eight cases of erysipelas in which a diplococcus thought to be the cause of the disease was found. Cover-glass preparations made with the pus from the pustules of four cases and from the blood of the affected part in all eight cases, showed the same diplococci in great numbers. Inoculations were made from each case upon glycerin-agar, blood-serum, and bouillon. In all the tubes pure cultures of this diplococcus only were found. G. E. Pfahler (*Phila. Med. Jour.*, Jan. 13, 1900).

From cases in which an erysipelatous inflammation was produced by the staphylococcus and experimental facts, the following conclusions are based: (1) that etiologically erysipelas is not a specific disease; (2) that in the rabbit's ear typical erysipelas may be produced not only by the streptococcus, but also by the staphylococcus, pneumococcus, and bacillus coli; (3) that human erysipelas is, as a rule, produced by streptococcus pyogenes, but that it may be excited by staphylococcus aureus; (4) that the question whether the facultative pus-producers—such as the pneumococcus, bacillus coli, and typhoid bacillus—are capable of producing erysipelas in man is still an open one. Jor-

dan (*Münchener med. Wochen.*, Aug. 27, 1901).

Prognosis.—The prognosis of erysipelas is very uncertain. The mortality-rate is somewhat above 10 per cent. Much will depend upon the rapidity and intensity of the course of the infection, and upon the organs which may be secondarily invaded by the poison, or possibly a complication by which a septicæmia may exist. Young and otherwise healthy persons would offer a favorable prognosis, while those more depleted, and especially those recovering from a lingering disease, would offer less hope of recovery.

In grave cases of erysipelas in newborn infants the prognosis is most unfavorable. Under these circumstances serum-therapy may be of great value. Dauchez (*La France Méd.*, Nov. 12, '97).

Treatment.—**LOCAL.**—The multiplicity of remedies advocated for the treatment of erysipelas is the best proof that no specific exists to arrest this infection. Prevention, therefore, should be sought for. The greatest adherence to aseptic principles and in the subsequent dressings of the case will insure the impossibility of the wound's developing erysipelas. Should, however, a contaminated wound present itself with the developing disease, antiseptics must intelligently be applied to the particular case as our sheet-anchor. The various remedies advocated by different authors rest upon this principle, each only claiming his antiseptic to have given the best results. This is probably the case, because the particular author has had most experience in that special method. Of all the antiseptics, that which is commonly believed to have the most germicidal power is 1 to 1000 sublimate solution of mercuric chloride, slightly acidified. The antiseptic must come in close proximity to the invading micro-organisms,

in order that it should exert its destructive power. Any method which will facilitate this will fulfill the indications. I, therefore, believe, with Kunert, that multiple scarifications and incisions should be performed when possible in order to facilitate the direct absorption of the antiseptic solution, while we also advocate, with Riedel and Classen, the scarification of the advancing margins of the erysipelas, so as to cut the development across before the micro-organisms have had access to them and fill these developments with an antiseptic solution, and so destroy them as they advance. The parts are kept thoroughly irrigated with the cold solution. If the patient should have some idiosyncrasy against mercuric chloride, a 3- to 5-per-cent. solution of carbolic acid may be used with efficiency. In fact, all the antiseptics known to-day have been, in turn, advocated, and, possibly, may be used with benefit.

Quinine should be administered in doses of 8 to 16 grains, in accordance with the temperature, 4-grain pills being given three or four times daily; so that the patient is kept constantly under the influence of the drug. Over the affected surface is applied an ointment made up of

R Bichloride of mercury, 1 grain.

Lanolin,

Vaselin, of each, $\frac{1}{2}$ ounce.

Arnozan (*Archives de Méd. et de Pharm. Militaires*, No. 2, '94).

Combination of camphor and carbolic acid in about equal parts preferred. It is antiseptic, but not escharotic. The skin must be thoroughly cleansed before its application, and it should be used thoroughly and frequently and ahead of the line of demarkation. Regular feeding at short intervals with highly-nutritious, but easily-digested, food is of importance. Frank Parsons Norbury (*Medical Fortnightly*, No. 8, p. 223, '98).

For erysipelas of the face and scalp ichthylol and vaselin, equal parts, form

an excellent local application, placing over this absorbent cotton.

The affected parts should be painted morning and evening with collodion, to which ichthylol has been added in the strength of 10 per cent., the application being made so as to cover the healthy skin for an extent of three centimetres around the affected patch; the application is always made from healthy to diseased skin. In eighty cases in which the author has used this method it has not failed once. When the varnish comes away the skin is left in a healthy condition. No bad effects of the treatment have been observed. Victor Cebrian (*El Siglo Medico*, Dec. 17, '93).

Hypodermic injections of pilocarpine recommended in facial erysipelas. The drug must be administered until the physiological effects are produced. Pilocarpine is contra-indicated in affections of the heart. If the erysipelas appear as a complication, the treatment is absolutely without efficacy. Salinger (*Therap. Gaz.*, Mar. 15, '94).

Thirty-two cases of erysipelas of the face and other parts of the body treated with compresses saturated in absolute alcohol, with excellent results. To prevent evaporation the compresses must be covered with some impermeable material and should be changed every fifteen minutes, until all inflammation has subsided, two or three days being generally required. Langsdorff (*La Sem. Méd.*, Feb. 27, '95).

Iodol excellent as an abortive of facial erysipelas, as proved in 25 cases. The remedy dissolved in collodion and the 10-per-cent. solution painted over the affected part in thick layer extending a few centimetres beyond the limits of the erysipelas. Rapid cure effected in all cases. Lobit (*Bull. Gén. de Thérap.*, vol. cxxxv, p. 540, '98).

Eight cases treated with mercurial ointment. It is efficacious against facial erysipelas even when tending to spread. Its value depends not only upon its bactericidal properties, but as well because it can penetrate the skin and reach the streptococci in the subcutaneous tissue. Prospero Dematteis (*Gaz. degli Osped. e delle Clin.*, No. 118, '99).

Sulphate of sodium is very effective as a local application, owing to the affinity which sulphate of sodium has for oxygen: abstracting it so rapidly from the diseased area as to soon destroy the germ of erysipelas. The area is first thoroughly cleansed, removing all greasy substances. Enough sodium sulphate being mixed with cold distilled water to give it the consistency of a thick poultice, the diseased part is covered with a single layer of gauze, and over this is spread a thick layer of sodium sulphate, care being taken that it extends considerably beyond the margin of the diseased area. The poultice is kept in place by a few layers of gauze. Ice-water is now applied to the poultice. G. L. Curtis (Med. Record, Apr. 20, 1901).

Ichthyol has been personally employed in the treatment of erysipelas with great success. The affected region and the adjacent area of the healthy skin are covered with a thick layer of ichthyol. It is seldom necessary to repeat the application on the third day. Usually the disease comes to a standstill, and desquamation follows inside of a week. Eschle (Heilkunde, No. 6, 1901).

Eighteen cases treated with red light-rays,—i.e., by excluding the chemical rays. The fever ceased in less than one day in 7; in one day in 1 case; in two days or less in 4 cases; in two and one-half days in 3 cases; in six days in 1 case, and in seven days in 1 case. Only 1 of the patients had any general symptoms, and he complained of headache. The red rays have no curative effect, but they are the only rays that are not directly injurious. H. Krukenburg (Münchener med. Wochen., April 1, 1902).

Hueter has recommended the parenchymatous injection of 2- or 3-per cent. solution of carbolic acid at the margin of the inflamed district, particularly in the beginning of erysipelas. In cellulotaneous erysipelas and cellulitis a series of incisions, each about two inches long, should be made in the inflamed

cellulose tissue in order to prevent gangrene and give exit to the pus or discharges. These incisions are made where the skin seems to be most inflamed, in the direction of the long access of the limb, parallel with the blood-vessels, so that these should not be wounded. It may be necessary to give an anæsthetic to make these incisions.

GENERAL TREATMENT.—General treatment will essentially consist in feeding the patient and giving tonics, chief among these will be the tincture of the chloride of iron in doses of 30 drops every two hours. This is supposed to have more of a specific action than any other drug recommended for the purpose. The value of Marmorek's serum has not as yet been established.

An antitoxin of streptococcic infection used in cases of erysipelas with success. The mortality before this was usually 5.12 per cent., while during the period of its use, in which 306 cases occurred, of which 165 were considered severe enough to be injected, the mortality fell to 1.63 per cent. Omitting certain cases with severe complications or associated conditions, the mortality was but 1.2 per cent. A weaker serum was then employed, and the mortality rose 4.82 per cent. When the dose was sufficient, improvement in the local and general symptoms took place in 5 to 12 hours and the temperature rapidly declined, becoming normal in 24 hours. If this did not occur, the dose was repeated. The dose varied from 10 to 20 cubic centimetres, and never exceeded 120 cubic centimetres in 10 days. Marmorek (Annales de l'Inst. Pasteur, Nov. 7, '95).

Treatment of 501 cases of erysipelas by serum prepared by the Pasteur Institute, with a mortality of only 2.59 per cent. The ordinary dose of serum varies between 6 and 10 drachms. Chantemesse (Med. Press and Circular, Feb. 12, '96).

Of 145 cases treated systematically by the ordinary methods, 5 died; of 409

cases treated by systematic cold baths, 16 died; of 297 cases treated by a Marmorek serum of medium strength, 5 died; and of 107 cases treated by a weak serum, 7 died; of 97 cases treated by a strong serum, but 1 died—the mortality being for cases not treated by serum 3.79 per cent., and for the serum-treatment, 2.59 per cent. After the injection the symptoms diminish markedly within a few hours, and disappear completely within a few days.

Antistreptococcic serum for the treatment of erysipelas must be prepared from cultures of streptococcus erysipelatosus; and not from cultures of streptococcus pyogenes, as these two organisms are specifically different. Parascandolo (Wiener klin. Woch., Nos. 38 and 39, '97).

Two cases of erysipelas in which antistreptococcic serum was successfully used. Points noticeable were: (1) the rapidity with which improvement was obtained; (2) the fact that the disease may be checked in its early stages; (3) the lack of local symptoms caused by the injections. The serum is considered to be of most value in severe cases of facial erysipelas, and should not be used in the majority of cases of the disease. W. Murrell (Lancet, June 24, '99).

One or two hypodermic injections of Marmorek's antistreptococcic serum is a very effective form of treatment, and will give in erysipelas as good results as have already been obtained by the use of the Behring-Roux antitoxin in diphtheria. This conclusion has been reached after an experience of six cases of erysipelas of the face in which it has been used. A. de Martigny (Maritime Med. News, Jan., 1900).

Case of traumatic erysipelas cured by two hypodermic injections of 10 cubic centimetres ($2\frac{1}{2}$ drachms) of antidiphtheritic serum after ointments and internal treatment had had no effect. Improvement quickly set in and continued uninterruptedly until complete recovery. G. K. Chapiro (Semaine Méd., xxii, No. 40, 1902).

Hypodermic injection of diphtheria antitoxin employed in two cases of

severe erysipelas of the face with favorable results. This non-specific action of the antitoxic serum is explained by its stimulating action on the phagocytic properties of the cells. Zwetaeff (Prak. Vrach, No. 22, 1902).

Cases of scarlatina and measles treated with beer yeast with rather remarkable results. Most of the observations were taken during epidemics in which there were numerous fatal cases and cases complicated with meningitis, broncho-pneumonia, nephritis, etc., but the patients treated with the yeast, for the most part, became convalescent within three or four days after the appearance of the exanthem, and in no case so treated did the disease last longer than sixteen days. Twenty-four cases of erysipelas were markedly influenced by the administration of the yeast; the high temperature and other symptoms quickly disappeared. In four days the local lesions became merely slight redness and infiltration, and these manifestations disappeared by the sixth day, followed by desquamation. The constitutional symptoms ameliorated within forty hours and disappeared in about three days. In advanced cases with complications, such as anuria, cardiac insufficiency, hyperpyrexia, and pulmonary congestion, the treatment produced good results, and there was no recurrence of the malady, even though some of the cases had suffered previous attacks. In all cases the dosage was from 4 to 6 teaspoonfuls of the dry yeast every twenty-four hours. Presta and Tarruella (Revue française de Méd. et de Chir., No. 15, p. 354, 1904).

The best diet will be milk, beef, tea, eggs, champagne, and beer.

The bowels should be regulated, and an anodyne given to induce sleep and relieve restlessness.

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ERYTHEMA.

Definition.—Erythema as a generic name has been used to serve a complex or rather triple purpose. In itself the

term simply denotes redness of the skin in which varying graduations of tint from yellowish red to violaceous red, darkish red, bluish red, or even blackish red are observed. In size it may not involve a spot larger than a lentil, and again it may cover a limb or the greater portion of the trunk. It may assume a rounded, oval, or an irregular outline. As a significance of disease or disturbance of the functions of the skin it implies, on the one hand, only an hyperæmia or active inflammation. As these two forms are so likely to merge into each other, it is a difficult matter to determine just where the hyperæmia ends and the inflammation begins. This is a pathological rather than a clinical problem. Both of these forms have been usually placed in the class of inflammations, although recently Dühring, of Philadelphia, has placed the former in his class of hyperæmia, referring to them as "disorders characterized by the presence of an abnormal quantity of blood in the vessels supplying the skin, without the presence of inflammation." In this class is included erythema hyperæmicum, or simplex, and in the class caused by actual inflammation is included erythema exudativum, under which titles we will discuss them.

Simple Erythema.—In this form there is a discoloration of the skin, varying in tint, size, and shape, and due to an abnormal flux of blood to the tissues without the presence of inflammation.

SYMPTOMS.—The affection is transient, the coloring fading under pressure, and is caused by numerous internal and external agencies. It is instanced by the abnormal flushings and blushings which are the expression of the varied feelings, such as anger, joy, and shame; it is also produced by disturbances of digestion due to indigestible foods, alco-

hol, drugs, or by various external injuries, as, for instance, the action of heat or cold, poisonous plants or drugs, or traumatism. The lesions produced vary from the slightest tint of red to a very dark color, and vary in shape from a round or oval to an irregular patch.

ERYTHEMA PUDORIS.—This form bears considerable analogy to the above, but it is the expression of menstrual disturbances, pregnancy, climatic influences, and general disorders. The difference between this and the foregoing variety lies in the cause. This latter affection is the result of some psychical influence, and usually progresses as the patient ages. Chronic blushers belong to this category.

Erythema Venenatum.—Certain mineral and vegetable substances also produce an erythema, but if the contact is prolonged actual inflammation takes place, and vesicles, pustules, or other symptoms may be observed. This form of erythema occupies the point of contact, and is manifested by a distinct, pinkish-red, irregular patch of small or large size, according to the amount of surface acted upon by the irritant. Mustard, cantharides, sulphur, strong soaps, ivy and other plants, acids, and many other drugs may be mentioned as some of the causes. This form of erythema usually persists for some time after the removal of the causative influence, and in cases in which the skin is delicate the most energetic treatment will be demanded.

Erythema Caloricum.—Both heat and cold may give rise to erythema. That induced by heat is diffuse, and, although its disappearance follows immediately upon the withdrawal of the causal factor, it may persist for some time in fair skins, to be, in turn, followed by some degree of desquamation. Exposure to the ac-

tinic rays of the sun is the usual and greatest exciting cause, although it is observed in many persons who are obliged to work around stoves or machinery.

Patient who suffered from a relapsing solar erythema on the backs of the hands. For six consecutive years this disease appeared at a time of the year during which it had first made its appearance; it involved the backs of the hands; the face, shaded by the hat, had escaped. The patient was an alcoholic; the liver was enlarged. Dreyfus (Province Méd., June 19, '98).

Cooks, stokers, and men or women who toast their shins before the open grate present gyrate patterns and annular patches of redness (*Erythema ab igne*, Crocker). This condition generally disappears without leaving any trace, but there are cases in which the causative influence is often repeated; some degree of pigmentation is induced and may persist for long periods, if it is ever at all removed. Hammer refers to certain cases in which the action of the sun's rays disappears immediately upon entrance indoors, and speaks of these cases as not being influenced by the heat of a fire, but as being observed in winter as well as in summer. Cold exerts a similar influence upon certain subjects and is shown by a livid, bluish, or cyanotic appearance at the point of contact. Exposed for long periods pigmentation may be observed, or the condition may terminate in inflammation or ulceration.

Erythema Traumaticum.—Violence of slight degree causes a diffuse redness at the point of contact, which may vary from a slight tinge of yellowish red to that of a dark red. Even under slight traumatism, if contact is allowed to continue, the condition will induce inflammation with all its consequent phenomena of vesicles, pustules, or bullous lesions. Complications may arise in the

form of a true dermatitis, eczema, or other form of irritation or ulceration, and permanent pigmentation follow.

The exciting agencies are numerous, and the degree of injury depends upon the actual cause. Ill-fitting wearing apparel or even bed-dressings, tight garters, shoes, trusses, and diapers are some of the factors most commonly met with, while fæces and salivary and leucorrhœal discharges may represent another class among causal conditions. Repeated attacks leave the point of affection prone to other affections; the most important of these is bed-sore, which occurs as the result of being too long in one position and thus inducing pressure upon one portion of the body, or lying upon rough and unclean bed linen. Certain occupations tend to the production of local erythema, as, for instance, in the case of persons who are obliged to remain seated for long periods, as shoemakers, or those who stand indefinitely, as clerks.

Erythema Neonatorum.—During the first week of life we sometimes meet with a diffuse universal redness; according to Elliot, this rarely extends beyond the seventh day. Beginning as a pale-red spot, it reaches its highest coloration about the third or fourth day, and then gradually fades, without leaving any desquamation. Elliot states that "during its involution, a yellow color, resembling that of icterus, may become apparent, and in very severe cases there may be petechia." The usual causal factor in its production is some form of external irritation, harsh manipulation, either with the hands or towel while bathing or dressing, and exposure to the atmosphere.

Erythema Læve.—This term is applied to red patches apparently produced by œdematous conditions of the limbs. Impaired circulation is the probable cause. Swelling, redness, tensity, and a glossy

or waxy appearance of the skin are the usual symptoms met with. Allowed to continue, these symptoms usually terminate in ulceration. Erythema œdematosum is applied when great œdema is present.

Erythema Simplex Symptomaticum.

—Under this heading belong all the erythemas which are due to some internal derangement, whether of the intestinal canal or from some general disease of the system. In some instances the cause is the ingestion of some food which retards digestion; in others the general economy is disturbed by some drug, such as alcohol, phenacetin, or other substance. This form of erythema does not respect any portion of the body; it most frequently attacks the face, neck, and upper portion of the chest and back.

ERYTHEMA INFANTILIS. — Erythema in the infant results from derangements of digestion, teething, and a number of other affections to which young children are prone. It appears, for the most part, upon the face and trunk, although other surfaces are liable to be affected. It may vary from a rosy-red macule of diminutive size to a lesion circular or semicircular in form, or present multiform manifestations. It is rarely elevated, causes some itching, but usually disappears in a few days. It may be persistent if its causes are not removed, and is sometimes followed by a slight desquamation.

ERYTHEMA MEDICAMENTOSUM.—The lesions produced by drugs internally administered upon the skin are manifold in character and may at times resemble many other diseases of the skin, but the fact that one of a series of eruption-producing drugs—such as the coal-tar derivatives, antipyrine, antifebrin, phenacetin, and others—as salicylic acid, quinine, and iodine—have been ingested will generally lead to a correct solution

of the difficulty. (See DERMATITIS and the various drugs named.)

Number of cases observed in which an erythema of the face was developed from nasal insufflations of salol. Cartaz (Med. Bulletin, Aug., '91).

Case of facial erythema in a woman suffering from hypertrophic rhinitis following influenza, due to cocaine applied to the nasal mucous membrane. Castex (Le Bull. Méd., May 24, '93).

Antipyrine in some persons provokes eruptions differing widely from the average type of drug eruptions. They begin by a sensation of pruritus, to which succeeds an inflammatory œdematous tumefaction. The usual localities of such eruptions are at the union of the skin and a mucous membrane. The fingers and the scrotum may be secondarily affected. Congestive œdema may be the only manifestation, but usually vesicles are formed. They burst rapidly on mucous membranes, slowly on the penis, and often not at all on the skin, where recovery occurs by drying up and desquamation, while in the mouth they give rise to ulcers covered with a fibrinous deposit. They cause no cicatrices and rarely any pigmentation. The affection lasts from two to three weeks. Martin Brach (Therap. Monats., Nov., Dec., '94).

Attention called to the indelible pigmented patches following antipyrine erythema. The pruritus is intense, the patches discrete and non-symmetrical, attacking the places where the clothes press the skin. The form is oval, with the long axis placed transversely. In the beginning the appearance is erysipelatous, changing to vesicular; then desquamative, when it becomes blackish; at last it becomes fawn-colored and remains so. Morel-Lavallée (Le Bull. Méd., vol. i, p. 392, '95).

Several obscure cases of erythema in women. It began with tickling and pain in the skin; the hands were red on the dorsal surface and between the fingers. In severe cases the skin was considerably swelled and bullæ appeared. On the palpebra the erythema was quite erysipelatous, and ptosis often observed; a

lamellous desquamation followed usually. The cause of the disease was found to be the *Primula acutis* (common primrose), to which these women appeared very sensitive. In all the cases of erythema the primroses were kept in the rooms, and after removal of the plants the eruption disappeared. Accandor (Hospitalstidende, '97).

A veil drawn tightly compresses the nose and a portion of each cheek, disturbing the circulation and leading, possibly, to permanent dilatation of the vessels and consequent disfiguring redness, the area of which resembles a butterfly in shape, betraying its mechanical origin. O. Rosenbach (Berliner klin. Woch., Oct. 9 and 15, '99).

Case of a man of 37, who had taken moderate doses of Fowler's solution for furunculosis during almost six weeks, when an eruption appeared on his hands, feet, thighs, and scrotum. Large bullæ formed upon an erythema, and crusts were noted upon the scrotum. Besides, there were marked constitutional symptoms, all of which gradually disappeared during the two weeks following the cessation of the arsenic. This is the first reported case of a bullous eruption due to arsenic. Neumann (Wiener klin. Wochen., Nov. 21, 1901).

ANOMALOUS FORMS.—Under this heading may be included forms mentioned by Duhring as occurring in the course of asthma, rheumatism, gout, hemiplegia, chorea, epilepsy, exophthalmic goitre, and other toxic influences.

Erythematous and erythemato-papular eruptions observed in the course of blennorrhagia resemble those found in other infectious diseases, as pyæmia, etc. Dubreuilh (Annales de la Polyclin. de Bordeaux, July, '89).

Case of a man admitted to the hospital for unilateral rheumatism of the ankle and knee-joint. The following night an eruption suddenly manifested itself on the flexor and extensor surfaces of the arms, on the face, back, chest, and palms, but not on the backs of the hands. The patches were erythematous, pea-sized,

ill-defined, and very numerous, and were itchy from the beginning. The eruption continued to spread over the general surface, and four days later attacked the mucous membrane of the pharynx. The rheumatic pains subsided after the efflorescence began to appear. General desquamation set in two weeks after the first appearance of the eruption, having been preceded by a change in the character of the lesions, the characteristic patches of erythema multiforme giving way to a generalized eruption of numerous minute, yellowish-gray, superficial vesicles, such as are met with in scarlatina. Large, exfoliative patches of skin were thrown off, with glove-like casts of the hands and feet, similar to the exfoliation of dermatitis exfoliativa. The duration of the whole disorder was about three weeks. Duhring (Jour. of Cut. and Genito-Urin. Dis., Nov., '91).

A large proportion of the cases of erythema multiforme are associated with rheumatism, and can only be looked upon as results of the rheumatic poison. Stephen Mackenzie (Practitioner, Nov., '96).

Measles is often confounded, both by parents and medical men, with rubeola and also with certain roseolas. Also there are erythemas which resemble the exanthem of measles and which are of gastro-intestinal origin. In a healthy infant an eruption may suddenly appear, beginning, as in measles, on the neck. It may also occur on the trunk. There is no fever, malaise, or catarrh. There is, however, gastric disturbance, loss of appetite, furred tongue, fœtid breath, and sometimes diarrhœa. The writer draws attention to the importance of recognizing this condition in epidemics of measles, when a wrong diagnosis may be easily made. Raymond (Jour. des Mal. Cutan. et Syph., Nov., 1903).

This variety also includes the form observed during variola. It may be noticed about the second day of small-pox, and before the appearance of the specific eruption. According to Atkinson, of Baltimore, it generally spares the portions generally invaded by small-pox and

rarely lasts more than twenty-four hours. The character of erythema observed is a diffuse redness, of a violaceous color, and in size varies from a pin-head to a lima-bean.

Erythema vaccinum occurs during the course of vaccination. It may appear early, during the first two days, or may be delayed until the sixth or seventh, or at the time of beginning ulceration. Many patches of macules may be found over the body-surface, with here and there an isolated macule of a bright-red color.

But 2 cases of purpura and 14 cases of erythema in the course of 430 vaccinations. The erythema resembled the exanthem of measles. It developed in the course of from 24 to 72 hours, and persisted ordinarily for from 6 to 8 days. Epstein, (Jahrbuch f. Kinderh. u. physische Erziehung, B. 35, p. 442, '93).

Erythema diphtheriticum is the form of disease observed in connection with diphtheria, in both mild and severe cases. (See DIPHTHERIA.) It appears sometimes as late as the second or third day of the diphtheritic process, and may occupy the trunk or extremities only, or may cover the greater portion of the body. The lesions are a diffuse redness of a mottled, punctate, or scarlatinal form, and when in patches it is generally located upon the thorax and abdomen, though frequently upon the extremities. According to A. R. Robinson, it does not usually increase in size after the first few hours and disappears during the next twenty-four or forty-eight hours without leaving any desquamation.

Erythema Choleraicum.—According to Duhring, there is an erythematous eruption observed in cholera patients. It occurs in polymorphous manifestations. These are usually macular, maculo-papular, or papular, and are noted upon the dorsal surfaces of both the hands and

feet, forearms, legs, face, and trunk. It may appear either at the beginning or termination of the disease and disappears in the form of a desquamation.

Erythema also occurs at times in *uræmia*, *Bright's disease*, and *jaundice*. According to both Le Cronier Lancaster and H. Pye-Smith, lesions are observed. In *uræmia* the lesions usually occur during the later stages of the disease and just shortly before the patient's death. They are at first erythematous, and in a few days become papular; fresh erythematous and papular lesions may afterward be observed at different stages of development over portions of the body. The lesions appear upon the extensor surfaces of the hands, forearms, and legs, and when numerous are noted upon all portions of the body, including the palms of the hands, soles of the feet, and mucous membranes, and are especially well developed upon the face. Upon the face they tend to become confluent and cause great disfiguration. They are bright red, and beyond a slight deepening of tint remain as noted for three or four days. They disappear either as flaky desquamations (often being as large as those noted in exfoliative dermatitis), hæmorrhages being noted in the papules either during or previous to this stage, leaving a red, brawny thickened skin; or it may become eczematous and terminate in the formation of crusts or in the formation of pustules and abscesses. Itching sometimes accompanies this condition.

Pathology of Simple Erythema.—The erythemas are the result of disorders of the vascular system and particularly those of the smaller vessels contained in the upper layers of the corium and which radiate from there to the strata of the epidermis. Hyperæmia is but an excess of blood propelled into the smaller capil-

laries through vasomotor origin. The hyperæmia differs with the character of the exciting agency. Transitory hyperæmia caused by a slight injury generally fades quickly and no trace of its existence can afterward be determined, while those due to more marked lesions fade less quickly. Pressure leaves no visible change, though less pliability may be noticed. At first, in the active hyperæmias, the skin may be of a lighter hue, but in passive hyperæmia it becomes darker. Although the temperature is somewhat above that of the normal, it may not even affect or may even be slightly below that of the natural state.

Prognosis.—The prognosis of simple erythema is usually favorable. A slight hyperæmic process, unaccompanied by inflammation, quickly subsides, although some degree of pigmentation may remain to mark its site.

Treatment of Simple Erythema.—When the disorder is likely to disappear spontaneously, it is hardly necessary to advise any form of treatment, but in protracted cases, as well as those attended by recurrence, active measures should be resorted to. Errors of digestion require appropriate measures based upon the symptoms produced. Any intestinal irritant should be promptly removed by cathartics. In cases attended by tingling and burning or where a slight degree of exudation has taken place the application of some bland powder, simple lotion, or unguent will easily mend matters. Boric acid, either as a plain powder, in full or diluted strengths, a lotion in half or full saturated solutions, or as an ointment, $\frac{1}{2}$ drachm of boric acid to the ounce of ordinary petrolatum, will usually suffice. Lycopodium or fullers' earth will serve a similar purpose. At times it may be advisable to add a slight

quantity of carbolic acid to procure early relief.

Erythema Scarlatiniforme.—Erythema scarlatiniforme (named by Hardy), roseola scarlatiniforme (Bazin), or erythema scarlatinoides (Besnier), is an erythematous skin eruption closely resembling that observed in scarlatina, and from which affection it must be differentiated.

SYMPTOMS.—According to French dermatologists, there are two types of this affection. The one "érythème scarlatinoïde," an acute rash resembling either scarlatina or measles, and accompanied or not by desquamation; the other "érythème desquamatif scarlatiniforme récidivant," a subacute erythematous outbreak, resembling very closely scarlatina, usually accompanied by desquamation. As its name implies, it is a recurrent affection.

In the more acute type the lesions may be preceded, from a few hours or two or three days, by some constitutional disturbance, notably malaise, with chilly sensations and a rise of temperature of two or three degrees. The lesions, which are of a pinkish-red or crimson color, are punctate or diffuse and situated on the chest, thighs, face, neck, and other regions, although they are not particular to any region. At times there may be slight itching or burning. The duration varies from a few days to one or more weeks. Aggravated acute types may desquamate either as thin, flaky scales or in large-sized exfoliations. Observers refer to still another type in which the affection stimulates more particularly these characters of rubeola.

In addition to the general malaise, subacute cases are likely to present some disturbance of the renal functions and albuminuria. The lesions are rather more lasting and exist from periods vary-

ing from three to six weeks. When the eruption reaches its height there may be a lowering of the fever. A marked symptom of this variety is the number of recurrences, while desquamation is a prominent character. Hartzell refers to the diminution of severity with each succeeding attack.

DIAGNOSIS.—Owing to the great resemblance of this affection to the rash of scarlatina, it is important that a close differentiation be obtained. The symptoms of the latter affection may present characters — such as the strawberry tongue, sore throat, great depression, and the presence of large or small quantities of albumin in the urine—which will usually be sufficient for all practical purposes. The early desquamation or the desquamation during the height of the fever will generally serve to establish the nature of the affection present.

ETIOLOGY.—It may be the expression of forms of stomachic disturbances, such as produced by the ingestion of toxic agents, as alcohol, antipyrine, belladonna, copaiba, arsenic, opium, the iodides, salicylates, or carbolic acid.

Interesting case in a middle-aged woman in which the ingestion of $1\frac{1}{2}$ grains of quinine was followed by the appearance of a scarlatinoid rash over the whole surface of the skin, accompanied by painful swelled throat. The symptoms, however, disappeared in a few hours. Glax (Lancet, Jan. 17, '91).

Typhoid fever, surgical operations, rheumatism, parturition, certain infectious affections, and sewer-gas poisoning (Crocker) are among the numerous conditions which may give rise to the disease.

Woman observed in whom an erythema having no relation to scarlatina followed each of three labors. Gaertig (Centralb. f. Gynäk., No. 30, '94).

PATHOLOGY.—Why so many different avenues should lead to the same result is difficult to determine. Idiosyncrasy may

play a very important part in assisting its appearance. Brocq has advanced the idea that the desquamative or subacute variety, as previously noted, is only a benign form of pityriasis rubra, but this theory has not obtained many followers.

PROGNOSIS.—Serious consequences are unlikely to follow if produced by some form of irritative ingesta. Elliot states that the affection "is grave and indicative of death when it appears in the course of a pyæmia, a septicæmia, or a puerperal peritonitis." The relapses may be more or less numerous and a different cause may be ascertained in some cases for each recurrence.

TREATMENT.—The first indication is the removal of the inducing cause where possible. Should this be some form of irritative ingesta the use of catharsis may suffice. The local symptoms should be relieved by means of antipruritic or stimulating washes. Boric and carbolic acids are probably the best remedies of this class. It may be deemed advisable in many cases to use more active local measures. For this purpose some active drugs, such as menthol or thymol, may be used.

Erythema Induratum Scrofulosorum.

—This condition was first described by Bazin under the title "*érythème induré des scrofuleux*." It is an affection that may be mistaken for erythema nodosum. It is found in those persons of strumous diathesis and especially women and young girls (Crocker) who are easily fatigued and who are obliged to remain for long periods in a standing position.

Erythema peculiar to lymphatic or scrofulous young girls who are obliged to remain much of the time in an upright position. It is to be considered as a scrofulo-tubercular gumma developed in the subcutaneous tissue of the lower limbs, and associated with congestion of the skin in the neighborhood as a result of the venous stasis to which the local-

ization of the affection in these limbs is due. G. Thibierge (Med. Week, Paris, Jan. 17, '96).

It generally presents itself upon the anterior surface of the legs and occasionally upon the calf (Crocker); the lesions may be deep-seated nodes or nodules, which are either absorbed or break down into suppurating ulcers. In color they are first of a bright red, but they soon become darker or of a livid tint. After breaking they are observed to be punched out, round or irregularly oval ulcerations which resemble to a marked extent gummatous lesions.

In differentiating the early characters from erythema nodosum the acute and shorter course observed in the latter affection is to be noted.

Histological and bacteriological survey of the lesions of erythema induratum of Bazin, showing that there is nothing to authorize us to attach it directly to tuberculosis. The histological appearances seem to be due to fatty degeneration, which develops ulteriorly on regions affected with a considerable and spontaneous œdema. The inflammatory signs are there reduced to a minimum. The erythema induratum of Bazin is but a chronic, and occasionally ulcerative, variety of erythema nodosum. Audry (Ann. de Derm. et de Syph., Mar., '98).

Case of *erythème induré des scrofuleux* of Bazin with microscopical findings showing its non-relationship to tuberculosis. A few cocci were seen in the surface, but no tubercle bacilli were found. A guinea-pig inoculated with the fragments of tissue developed no signs of tuberculosis. C. T. Dade (Jour. of Cut. and Genito-Urin. Dis., July, '99).

Instance of indurated erythema and necrotic granuloma in the same subject. Bazin's erythema and necrotic granuloma are non-microbic. They appear first about the blood-vessels in the deeper layer of the corium, and work outward from that point. The evidence is in favor of the disease being of "toxic" origin. J. C. Johnston (Jour. of Cut. and Genito-Urin. Dis., July, '99).

Microscopical examinations of tissues obtained from three cases of the indurated erythema. In all the vascular channels were chiefly affected, exhibiting inflammatory and degenerative lesions with the presence of such a number of giant cells that they alone suggested the tubercular nature of the disease. The presence of the tubercle bacillus in more than fifty specimens examined could not be detected, however. The affection is tuberculous owing to the fact that inoculation from the tissue of one case gave positive results in rabbits. G. Thibierge and P. Ravaut (Ann. de Derm. et de Syph., vol. x, p. 513, '99).

Case with microscopic examination of the lesions. No tubercle bacilli were found. After consideration of the various relations of the two diseases, the writer concludes that the manifestation of erythema induratum is either tuberculosis or is related to that disease in a manner like that of lichen scrofulosorum to tuberculosis. Sollner (Monatsschefte f. Prakt. Derm., Dec., 15, 1903).

Diagnosis from syphilitic gumma is established by its longer duration before the occurrence of ulceration, and the serpiginous outline of the latter, or the presence of scars.

Erythema Exudativum Multiforme.—

Erythema exudativum multiforme is an acute inflammatory and exudative affection of the skin, characterized by the appearance of macules, papules, or vesicles, discrete or confluent, and of varying sizes and configurations.

SYMPTOMS.—The character of lesion observed, with its many configurations, has given rise to the use of certain terms which are indicative of the condition present. Erythema multiforme papulosum is used when the predominating lesion is of the papular type. Erythema multiforme tuberculosum when the size of lesion is slightly greater than the papule; erythema multiforme vesiculosum when of the vesicular type; erythema multiforme bullosum when bul-

lous; erythema multiforme annulare seu circinatum when it assumes an annular or rounded form; erythema multiforme figuratum seu gyratum when peculiar irregular lesions are formed from a coalescence of two or more annular or circinate rings; erythema multiforme iris when new lesions appear successively in the clearing centre of the preceding manifestation; erythema multiforme vesiculosum circinatum (herpes circinatus) when the borders of a papule are covered with a ring of vesicles; erythema multiforme vesiculosum iris (herpes iris) when several concentric rings of vesicles are formed; erythema multiforme urticatum (lichen urticatus) when from the oedema they closely resemble urticaria.

Erythema exudativum multiforme has points of predilection. For the most part lesions are observed upon the backs of the hands and feet, the forearms, and the legs. Next in frequency they occur upon the region of the head, the cheeks and neck, and lastly upon the trunk, the chest and back, and the abdomen. In aggravated cases, or in those unusual types, the lesions may be observed in other parts of the surface. They are usually first noted upon the hands and fingers, and from these regions spread to other parts, and result in some cases (as recorded by Dühring) to an enormous involvement of the whole general surface.

Death has been observed by Vidal and Leloir, and Molenes-Mahon speaks of a number in which death also occurred.

DIAGNOSIS.—The fact that death can occur from this affection renders an exact diagnosis of especial importance.

Eczema.—In papular eczema we may notice a symmetrical arrangement, but usually the lesions are regular as to size and outline. They may retain their appearance, but are prone to become either vesicles or pustules. Their duration is

rather more lengthened, and crusting is likely to result from the excessive exudation.

Psoriasis.—Psoriasis is not likely to assume a symmetrical arrangement. It is more likely to be covered with decided desquamations and to be of much longer duration.

Tinea Circinata.—Circinate ringworm is not usually symmetrical, is slower in its extension, and more persistent in its character. The edges in this affection are usually well defined.

Syphilis.—Careful examination should be sufficient to make a correct diagnosis. The papular, and other varieties, will usually give some distinct sign of the syphilitic contamination.

Urticaria.—The lesions of urticaria are mostly uniform and of a white color, usually of short duration (rather evanescent) and are not likely to present different stages.

Pemphigus.—The lesions of pemphigus are bullous, always remain so, and depart as such, while they appear rapidly and are asymmetrical; they are not accompanied with much inflammation.

Dermatitis Herpetiformis.—In this affection the lesions are multiform (erythematous, vesicular, bullous, or pustular), are not symmetrical, and usually run a chronic course.

Erythema Nodosum.—The lesions are deep seated and nodular, are usually observed upon the lower extremities (along the tibia), do not change in appearance, and are painful (almost rheumataform) at all times.

Erythema exudativum multiforme is a well-characterized and independent disease, to be distinguished from other erythemata produced by infectious disease. The disease is especially to be distinguished from erythema nodosum, and is quite independent of gout or rheumatism. The morbid phenomena are in-

flammatory in nature, and are caused by the local irritative effects of certain infective materials. Veiel (*Practitioner*, Nov., '96).

ETIOLOGY.—The cause or causes of this affection are obscure. It presents a tendency to recur at certain seasons of the year (usually the spring and fall), and is probably influenced by climatic changes.

Erythema multiforme regarded as a catarrhal disease. By this is meant that the same causes which produced catarrhs in people with susceptible mucous membranes produced this eruption in those with susceptible skins. Hutchinson (*Clinical Jour.*, Nov. 6, '95).

Numerous cases are recorded in which the affection recurred at regular intervals, as, for instance, every year at the same time, every three months, at intervals of six or more months, or at longer stated intervals. All ages are affected, and the disease seems to more greatly attack young children and young females. There is no doubt but that certain affections predispose to its appearance; thus rheumatism, gout, uræmia, Bright's disease, jaundice, diphtheria, and cholera.

Cases of erythema multiforme described where, owing to faulty processes in the digestive tract, the production and absorption of toxins were possible. Examination of the urine and feces disclosed a large excess of indol, skatol, indoxyl, and skatoxyl, as well as phenols and organic compounds of sulphuric acid. Disinfection by calomel was followed by very rapid cure. E. Freund (*Amer. Medico-Surg. Bull.*, Apr. 25, '94).

Under the designation toxic erythema attention called to a form of erythema occurring in the course of pus-formation. It is most commonly encountered in young children. Its form is usually macular or punctate, though occasionally of the papular or vesicular variety, and its course mild and of short duration, accompanied by moderate rigors, with rise of temperature, and subsequent desquamation.

The common form of small discrete macules of faint pink color, appearing first upon the abdomen and sides of the chest, few in number and widely distributed, are seen in the milder forms of endocarditis and empyema, tubercular abscesses, etc. In some cases of abscess of the middle ear or the mastoid this form is seen; but usually attendant upon these conditions we find the macular eruption rapidly changing to a papular, and in the severer cases to a vesicular form, with rigors of moderate severity, headache and backache at the beginning, followed by rise of temperature. These symptoms may follow an infected wound, accidental or intentional (as in vaccination), where there is rapid formation of pus and absorption of the toxic products of the same. The erythema is only a part of the general process, representing the action of toxins on the vasomotor centre. Cuthbert R. Barham (*Med. News*, Mar. 28, '96).

Certain drugs taken internally may alike be mentioned as a possible influence.

PATHOLOGY.—Erythema multiforme begins essentially as an hyperæmia, and is quickly converted into an exudative inflammatory disorder. It can hardly be classed as an essential and specific disease, a fact which some authors claim, if we can really believe that so many diverse conditions will produce it. There is no doubt but that we have in the process an angioneurotic element as claimed by Schwimmer, Lewin, and Auspitz. Many others have observed micro-organisms in the blood and lesions.

PROGNOSIS.—All cases tend to rapid recovery, although a number of relapses may occur. Deaths have been recorded, but when the large number of cases is taken into consideration this loss of life is very small.

TREATMENT.—Internal treatment is to be directed toward the removal of the exciting cause where possible. All irregularities of the viscera are to be

remedied. Rheumatic diathesis must receive attention, and iodide of potassium, recommended by Villemin, may be found of good service, 15 to 30 grains, thrice daily, as an absorbent in the vesicular and bullous form. Elliot says that it may, if given injudiciously, provoke an aggravation of existing conditions. In this class of cases Atkinson, of Baltimore, relies upon salicylic acid and the salicylates. I have frequently obtained excellent results with arsenous acid given during and between attacks.

Quinine is certainly demanded in those types which are presumably the effect of malaria. Antistrumous remedies—such as codliver-oil, phosphorus, and possibly strychnine—in those debilitated by such processes are valuable in the tubercular forms.

Local measures, while possibly directed alone to the relief of subjective symptoms, may also be found beneficial. Boric acid is of distinct value in this affection, and applied in a saturated watery solution gives almost instant relief from the itching and burning that is occasionally observed.

The sulphite or hyposulphite of sodium may often be used advantageously in the strength of from $\frac{1}{2}$ to 1 drachm to the ounce of water. Ichthyol may be found of service in the vesicular and bullous types. At times stimulating remedies may act efficaciously, especially salicylic acid, carbolic acid, sulphurous acid, and hydrocyanic acid in varying strengths of solution.

In the urticarial type antipruritic lotions may be demanded. Mild cases may not require treatment, the subjective symptoms being very slight.

Erythema Nodosum.—Erythema nodosum is an acute inflammatory affection of the skin, characterized by the appearance of symmetrical, elevated, vari-

ously sized, shaped, and colored nodular formations, accompanied by constitutional disturbance.

SYMPTOMS.—Preceding the appearance of the lesions of an erythema nodosum there is usually general constitutional disturbance. Chills, with an elevation of temperature, or myalgic or rheumatic pains may be encountered. According to Duhring, cedema may be one of the first symptoms, while visceral involvement—with, later on, lesions of the heart and kidneys—may be present. For the most part, the nodes are localized upon the anterior surface of the shins, along the line of the tibiæ, and are arranged symmetrically. They are also observed, in exceptional instances, upon other parts, the arms and face, and I have recently observed a case in which the lesions were situated upon the chest, along the line of the ribs, and upon the abdomen. Pospelow, quoted by Elliot, noted similar involvement of the mucous membranes of the mouth. These nodes appear rather suddenly, developing rapidly, and are of a light or rosy red color, but later become darker in appearance, of a bluish or of a purplish tint. Appearing either singly (usually) or in crops, the process may extend over a period of from one to five weeks (or longer), although each individual lesion lasts only about six or eight days. While disappearing they assume various colors, from a yellow to blue or purple, and closely resemble a bruise. During their height they have a tense and shiny look, and give to the touch an indistinct impression of containing fluid. They rarely suppurate, absorption generally taking place, although this result has been observed by Haisholt and others. Dilatation of the capillaries has been observed by Lewin and Unna, while Van Harlingen has noted lymphatic involvement.

Hæmorrhage has, according to Demme, been observed in a case in which gangrene also took place. They are always painful and at first are firm to the touch, although they soon become softer, as they are disappearing. Some authors have described an ominous form of the affection in which tuberculosis is noted. Occasionally erythema nodosum and erythema multiforme are co-existent, especially that variety of erythema multiforme in which papules are the predominant manifestation.

DIAGNOSIS.—While with a careful survey of the lesions presented, as well as the concomitant phenomena, little cause may exist for error in diagnosing erythema nodosum, some instances do occur in which difficulty may be experienced.

Contusions are likely to be single and do not present those deep nodular formations. The cause can generally be determined.

Syphilis.—The syphilitic gummata, especially the non-ulcerating variety, which often resemble erythema nodosum, are sharply defined, indolent, and occasion no pain.

Erythema nodosum, a variety of polymorphous erythema, occurs frequently in the course of known infectious maladies as a secondary affection. Primary erythema nodosum results probably from a latent infection.

Cutaneous manifestations, reproducing with absolute fidelity the clinical type of erythema nodosum, are met with in the course of syphilis. This erythema may be due to a coincidence, and may result from some infection superadded to syphilis; but it is most frequently determined by syphilis itself.

There exists between syphilitic erythema nodosum and gummata of the skin and subcutaneous tissues a series of intermediate affections producing between these two kinds of lesions an insensible transition, and showing that between these two clinical types there is only a difference in intensity in the

anatomico-pathological process. Beurmann and Claude (*Annales de Derm. et de Syph.*, No. 4, '96).

Erysipelas generally presents a hard, though diffuse, inflammation, instead of a more circumscribed character of swelling.

Erythema Induré des Scrofuleux is not painful, is asymmetrical, of longer duration, and tends to ulceration; occurs in scrofulous subjects.

ETIOLOGY.—Erythema nodosum is an affection of early life, although instances in which it has affected varying ages have been recorded. Out of a total of 108 cases, S. Mackenzie found 14 under 10 years of age, 69 between 10 and 30, 15 between 30 and 40 years, and 10 over 40 years of age. Comby has presumably recorded the youngest, 14 months old. Most authors consider that the spring and autumn contribute the greatest number. Rheumatism accompanied many cases. Malaria was found to be a possible exciting cause by Boicesco.

Severe form of erythema nodosum occurring in five children, three of one family, suggesting contagion. In two cases several of the nodules became gangrenous. In spite of the rapid exhaustion attending these cases they all recovered. No bacteria were discovered in the blood, but in the tissue-fluids of the intact nodules and in the bullæ, pustules, and gangrenous patches micrococci and bacilli were found. Pure cultures of the bacilli, when inoculated upon the abdominal skin of guinea-pigs, produced an eruption of erythematous lumps followed by gangrene. Inoculation of the micrococci produced no result. Demme (*Fortschritte der Med.*, No. 7, '88).

Four cases of erythema nodosum seen appeared to have been conveyed by contagion. Lannois (*Annales de Derm. et de Syph.*, p. 535, '92).

The nodular form of iodic eruption described in a woman where the lesions reached the size of the fist upon a par-

alyzed limb, but vascular changes present probably accounted for the exaggerated size. Fordyce (Montreal Med. Jour., Nov., '95).

PATHOLOGY.—Erythema nodosum is due to an inflammatory process, at first active and later passive. Atkinson, of Baltimore, argues that it is an overcrowding of blood- and lymph-vascular spaces and exudation of blood-cells, both white and red. The process affects the entire skin, and is believed by Kaposi to be a more fully-developed and stable urticarial wheal.

PROGNOSIS.—The prognosis is usually favorable. Relapses may occur or the process may be extended by successive outbreaks of new lesions. The usual length of each attack is from one to five weeks, although the individual lesions usually run their course in from six to eight days. Death has been recorded, but this is exceptionally rare.

TREATMENT.—The disease tends spontaneously toward recovery, and it is very highly probable that constitutional measures exert little influence. General disturbances of the constitution require appropriate attention. A bland diet should be advocated and rest in bed advised. Iron, quinine, phosphorus, acetanilid, and phenacetin are often beneficial. To reduce inflammation, relieve pain, and prevent complications, a solution of sulphite or the hyposulphite of sodium in water, 1 drachm of either to the ounce, will be found useful. Ichthyol has also been of service in many hands (1 drachm to the pint of water). Carbolic acid, sulphurous-acid solutions, lead-water and laudanum, boric acid, and hot fomentations may also be mentioned as useful remedies when the others mentioned fail.

J. ABBOTT CANTRELL,
Philadelphia.

ERYTHROL-TETRANITRATE is a polyatomic organic nitrate which, as do all bodies of this class, detonates when struck with a hard body. In this particular it is even more sensitive than gun-cotton or dynamite. Its dangerous activity may be developed when gently stirred with apparently harmless compounds.

Explosion of erythrol-tetranitrate in which Mr. Lewis Jones, a qualified chemist, lost his life. Mr. Jones was engaged in stirring together in a mortar a mixture of erythrol-tetranitrate and lactose, presumably for the purpose of making tabloids. The quantity of the active drug served out to him was 4 ounces, and there is reason to believe that the dangerous nature of the combination was fully explained to him at the time by the chief of the department. Editorial (Brit. Med. Jour., Jan. 1, '98).

I consider the drug perfectly safe unless rapidly heated or struck or mixed with some readily-oxidizable substance. Indeed, during its investigation my assistant and I were surprised, knowing its composition, at its stability. J. B. Bradbury (Brit. Med. Jour., Jan. 1, '98).

Erythrol-tetranitrate is solid and crystalline, and melts at a temperature of 61° C. (142° F.). When pure it is colorless, and if kept in a dark and moderately cool place is fairly stable. If exposed to warmth, and especially sunlight, it rapidly undergoes decomposition, turning yellow and giving off nitrous fumes. Its solubility in water is slight, but it dissolves readily in alcohol and in ether. (Bradbury.)

Dose.—The dose of the solid nitrate is $\frac{1}{2}$ to 1 grain. It can be given in pill, tablets, or in alcoholic solution.

Physiological Action.—It is a vasodilator, and belongs to the group of which glycerol-trinitrate, known familiarly as nitroglycerin, may be regarded as the typical representative. Blood-pressure experiments show that the

nitrate of erythrol and mannitol have a less marked, but more prolonged, action than those of glycerol and glycol.

Therapeutics.—Bradbury speaks highly of its therapeutic properties in warding off attacks of angina pectoris and in keeping down arterial tension in chronic Bright's disease.

Case of angina pectoris treated by erythrol-tetranitrate. To avert the paroxysms it became necessary to administer the remedy in steadily increasing doses. The patient finally took $\frac{1}{2}$ drachm in the day: that is, 6 grains at 6 A.M., to enable him to dress at 8 A.M.; 6 more at 10 A.M., 2, 6, and 9 P.M., together with $\frac{1}{25}$ grain of trinitrin at 10.30 P.M. to enable him to ascend the stair and get to bed. He is in perfect health, barring the seizures, which are always at hand, if a tabloid chance to be omitted. No physiological effects whatever have at any time been manifested. As these doses of erythrol are unwontedly large, possibly unprecedentedly, the fact is worthy of record. It is unfortunate that the preparation of this remedy is so costly. Edward Garraway (Brit. Med. Jour., Jan. 1, '98).

Erythrol-tetranitrate used with good effect in 3 cases of aortic regurgitation accompanied by cardiac pain. In 2 other cases amyl-nitrite was more effective. In 3 cases of chronic interstitial nephritis 2 were benefited; the third could not be persuaded to continue treatment. In 1 case of Raynaud's disease the effect was very satisfactory. H. Walsham (Brit. Med. Jour., Nov. 4, '99).

ETHER.—Sulphuric ether, or oxide of ethyl $[(C_2H_5)_2O]$, is a colorless, volatile liquid which evaporates at ordinary temperatures. Vaporized ether is heavier than air, and, being inflammable, its use as an anæsthetic in the presence of artificial light other than an incandescent electric lamp, is, therefore, attended with danger, unless the light be placed at a considerable distance above the patient. Ether has a penetrating odor, generally

regarded as pleasant, and a sharp, burning taste.

To avoid deleterious effects, it is necessary to use a pure preparation. The purity of ether may be tested by adding to it a small amount of oil of copaiba. Clearness of the solution indicates its purity; any emulsion or cloudiness indicates the presence of alcohol or water.

COMPARATIVE VALUE.—Ether is extensively used as an anæsthetic in the United States. In other countries chloroform is still preferred by the majority of surgeons, but ether is steadily gaining advocates, owing to its superiority in practically every direction. It possesses the following advantages: Greater safety, less marked after-effects, greater rapidity of induction of anæsthesia, equal muscular relaxation, and less shock.

The comparative safety of ether as an anæsthetic is further demonstrated by statistics. Those of Foy, based upon 877,507 chloroform administrations, show a mortality of 204, or 1 in 4301, while those of Julliard based upon 314,738 ether administrations show a mortality of only 21, or 1 in 14,987.

Three hundred and fifty thousand cases reported in which ether was used, with but 25 deaths, and 134,000 chloroformizations, with 46 deaths. Garré (Beitrag z. klin. Chir., B. 11, H. 1, '94).

Ether is gaining ground rapidly in Germany as a routine anæsthetic. Its tendency to produce post-anæsthetic nausea and aspiration pneumonia is practically its only drawback. The latter complication is due to the inhalation either of the saliva, which is always secreted in large quantities, or of vomitus. Various attempts have been made to modify this tendency of the anæsthetic, and of these the most promising is the injection of scopolamin and morphine. As first used, this combination was intended to supplant other anæsthetics completely, and the alkaloids were given in doses sufficient to paralyze

the faculties without the assistance of any other agent. The high mortality which speedily followed, however, proved the method too dangerous to be persisted in, but the author has found that, given in amounts too small to be hazardous, scopolamin and morphine react most favorably on ether anæsthesia, producing a narcosis agreeable to the patient and free from vomiting or salivation and their attending dangers. The routine is as follows: First the usual preparation, catharsis, fasting, etc.; then one-half to one hour before the operation the injection of $\frac{1}{2}$ milligramme of scopolamin in freshly prepared solution, and 1 centigramme of morphine. The anæsthesia is begun one-half to one hour later with ether, on Wanschér's mask, administered very gradually, so that the surgical degree is not produced till ten minutes or more have elapsed. No danger need be apprehended from this dosage, and the patients are not salivated or nauseated and recover from the anæsthetic without the usual prostration. Ninety-three cases treated in this way gave excellent results, but on several subsequent occasions a protracted tachycardia was observed. Hartoz (Münch. med. Hoch., Nov. 17, 1903).

ETHER PNEUMONIA.—In recent years, however, the view has been advanced that the mortality of ether was as great as that of chloroform when the after-effects of the former were taken into consideration. Cases in which pneumonia followed the administration have been repeatedly reported, some of which developed a few hours after anæsthesia.

In criticising the above cases Dudley Buxton states that, on carefully investigating the history of so-called cases of bronchitis and pneumonia following ether, but few are found to be really due to that agent. Removal of the patient to a cold ward after he has been in a hot operating-theatre and subjected to severe shock is the more probable cause of lung trouble, while the flow of saliva into the air-passages suggests the possibility

of infection. These are independent factors which due care during and after the administration of the anæsthetic can counteract. It is important to bear in mind, however, that the untoward effects of ether are mainly exercised upon the respiratory system.

The term "ether pneumonia" is misleading. There is no evidence that lobar or croupous pneumonia occurs after ether with greater frequency than might be expected from the normal rate of incidence of the disease. Pneumonia after ether inhalation does not differ from the ordinary type. On the other hand, catarrhal pulmonary affections are prone to follow ether inhalations. J. F. W. Silk (Practitioner, Mar., 1900).

Physiological Action.—An all-important element in the physiological action of ether is its irritative influence upon the mucous membrane of the respiratory tract. Great irritation of the nasopharyngeal and laryngo-tracheal membrane thus ensues from the start, and arrest of respiration may be induced reflexly through the pneumogastric. Upon this fact is based the prophylactic measure proposed by Laborde, of Paris, and subsequently by Rosenberg in 1895, to apply a weak solution of cocaine to the nasal cavities prior to anæsthetization. The reflex influence is thus counteracted through the benumbing action of the cocaine. The struggling and choking usually witnessed when the ether is administered too hastily is the result of the local irritation produced. The action of ether is principally exercised upon the respiratory centres.

[A tardy "cardiac syncope" under ether does not occur. If ether kill the healthy subject at all, it kills by asphyxiation, while chloroform may kill suddenly at any period of its use. DUDLEY BUXTON, Assoc. Ed., Annual, '95.]

Advantages of the cocaineization of the nasal mucous membrane preceding and during the anæsthesia are:—

1. As the patient's perception of the odor of the anæsthetic is much diminished, the feeling of suffocation is entirely absent.

2. The stage of excitement is either short or entirely absent.

3. Vomiting during narcosis is rarer than usual.

4. Sickness following anæsthesia does not occur.

The patient is directed to blow his nose in order to free it from mucus, then 2 centigrammes of a 10-per-cent. solution of cocaine are sprayed into each nostril. After a pause of two minutes 1 centigramme of the solution is applied again to each side, and then the anæsthesia may begin. Every half-hour the application of cocaine is to be renewed. Before removing the patient, the nose should receive a final spraying. At each application about 1 grain of the salt is used. It is important to maintain full anæsthesia uninterruptedly, as the dangerous fluctuations in the character of respiration and pulse always coincide with the necessity for crowding the anæsthetic. Rosenberg (*Annals of Surg.*, Jan., '96).

Case of spasmodic closure of the glottis from the inhalation of ether. The anæsthesia had been started with nitrous oxide, but after the ether had been given a little while the conjunctival reflex was almost abolished, the quiet breathing suddenly ceased. A finger pushed into the glottis showed that it was tightly closed. After the glottis had been opened by the finger, respiration was re-established and the anæsthesia continued with A. C. E. mixture. McCardie (*Brit. Med. Jour.*, Jan. 20, 1900).

The influence upon the temperature is quite marked and is due partly to depression of the nervous system, the rapid evaporation and elimination of the drug from the lungs and general system, and the active perspiration produced. These factors are doubtless operative in the production of the pulmonary after-effects reported.

The temperature is lowered to greater extent under ether than under chloro-

form. Angelesco (*La Semaine Méd.*, Dec. 14, '94).

Ether, chloroform, alcohol, morphine, and other narcotics have the power of paralyzing the heat-regulating mechanism; so that a warm-blooded animal can no longer maintain its temperature, and becomes for the time being cold-blooded. It is remarkable that an animal so high in the scale of homoiothermism as the monkey should suffer no bad effects from having its temperature reduced to 14° C. (57.2° F.),—a fall from the normal of about 44° F. When the rectal temperature fell sufficiently low, from 25° to 23° C. (77° to 73° F.), a condition of what might be termed "artificial hibernation" was induced, and in this condition the animal remained and tended to take the temperature of the medium in which it was placed. It had no power of self-recovery, and continued to sleep on until warmed by artificial means. S. Simpson (*Jour. of Physiol.*, Dec. 15, 1902).

Important also in the production of untoward results is the influence of ether upon the kidneys. Albuminuria follows the administration of ether but rarely, but the presence of renal disorder prior to the use of the anæsthetic is a possibility to be considered in all cases in which albumin was found in the urine. Should renal insufficiency be induced, the pulmonary œdema witnessed as a complication would find a ready explanation, although death occurring during or after ether narcosis from œdema of the lungs has been attributed by Poppert and others to the toxic action of the ether. The majority of cases of post-anæsthetic bronchitis and broncho-pneumonia are also thought to be ascribed to these pathogenic factors.

Albumin found in seven out of one hundred cases. It disappeared within forty-eight hours in all. Campbell (*Annals of Surg.*, Dec., '94).

In one hundred and fifty cases in which the urine was examined before and after etherization, but one case is found in which albumin was present

after etherization, where it had been absent before, and this disappeared five days after the operation. Barends (Münch. med. Woch., No. xli, '94).

[These results agree with those of Wunderlich, Alber, Rindskopf, and with my own. Ether-vapor is very rapidly eliminated,—mainly by the lungs. It is important to ascertain, in all cases of albuminuria following ether, whether the emunctories other than the kidneys are so damaged as to throw the elimination upon the latter. In my own experience any grave renal lesion following ether has been most exceptional, and I have never been able to satisfy myself that ether has ever caused a death in this way when it was given by me. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

In 34.6 per cent. of cases given ether, albumin was not found before the ether was given, but was found afterward. In 34.6 per cent. albumin was found before and was increased afterward. In 26.6 per cent. of the cases there was no increase in the quantity of albumin after the ether was given. In 1.54 per cent. albumin was not found before or after the ether was given. In 1.33 per cent. albumin was found before, but was considerably less after the ether was given. In 1.33 per cent. albumin was found before ether was given, but was absent afterward. In 14.6 per cent. of the cases renal casts were found in the sediment before ether was given and were increased in number afterward. In 57.3 per cent. casts could not be found before or after. Only about 10 per cent. of the patients passed urine which was highly concentrated after taking the ether, the remainder only a slightly concentrated urine. The quantity of ether given in these cases varied from 100 to 800 cubic centimetres, and the length of time the patients were under the influence of the ether varied from ten minutes to an hour and a half. J. B. Ogden (Jour. of the Boston Soc. of Med. Sci., '97).

Series of cases which show that the quantity of urine, after the administration of ether, was reduced in amount. This reduction is in the urinary water only. There is little evidence to show that ether exerts directly any deleterious

influence on the kidney-parenchyma. This anæsthetic should be given with care, and an undue quantity should not be administered. Dudley Buxton and A. G. Levy (Brit. Med. Jour., Sept. 22, 1900).

Although ether is not destructive to red blood-corpuscles, it nevertheless produces diminution of the hæmoglobin and leucocytosis: effects which render rapidity of the operative measures desirable.

Ether anæsthesia in men has no destructive influence on the red corpuscles; it causes a very marked leucocytosis, the maximum amount of leucocytosis being first found immediately after the anæsthetic is well drawn; it may produce albuminuria; yet, even where there are diseased kidneys, ether is preferable to chloroform. Lerber (Centralb. f. Gynäk., No. 19, '97).

Ether causes blood-destruction; those who believe otherwise are misled by the concentration of blood due to preliminary treatment and sweating during the administration. The color index almost always (forty-nine out of fifty cases) falls and the number of corpuscles increases, showing marked blood-destruction and increased production of corpuscles deficient in hæmoglobin. Sections of marrow of the femur of a rabbit etherized to death showed marked erythroblastic proliferation. The hæmoglobin is absolutely reduced after etherization, as shown by reduction in individual corpuscular hæmoglobin value. The increased hæmolysis which occurs is nature's effort quickly to replace the destroyed corpuscles, and the regenerated cells are lacking in hæmoglobin.

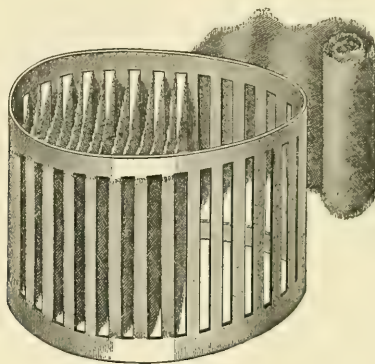
It is urged that whenever possible one or two blood examinations be made before preparation of the patient for etherization. Less than 50 per cent. of hæmoglobin indicates that an anæsthetic is dangerous and only allowable in vital emergencies. J. Chalmers Da Costa and J. L. Katelyer (Boston Med. and Surg. Jour., June 13, 1901).

Method of Administration. — The stomach should not contain food, lest it

be regurgitated during the administration of the anæsthetic; hence nothing should be taken by the patient within the four hours preceding the operation, the last meal being liquid; a soft-boiled egg may, however, be included among the aliments allowed. The rectal administration of milk with a little brandy or caffeine, or warm coffee, is advisable when the operation is to be a prolonged one, or when the patient is weak. False teeth and neckwear should be removed, and everything so disposed as to insure respiratory freedom.

the opening being at least one inch in diameter, the aim being to give a very small quantity of the anæsthetic at first, and to mix that with a sufficient quantity of air. An imperfect cone is worse than the plain folded towel used by many operators, since the air is easily admitted from all sides beneath the horizontal surface of the towel.

When a more perfect instrument is to be used, Allis's inhaler (see illustration) can be recommended. Its perpendicular linen partitions allow a free passage of air, and when the patient inhales he re-



Allis's inhaler.

INSTRUMENTS.—The method most generally utilized is to form a cone or cornucopia with a towel; but the cone usually obtained in this manner is closed at the upper end; when the ether is poured into it, and when its base or open extremity is applied to the face a quantity of ether-vapor deprived of air suddenly impinges upon the mucous membrane of the upper respiratory tract, and suffocation, manifested by struggling and other evidences of fright, results. If a cone is employed, therefore, the apex should be open as well as the base,

ceives, if the instrument is properly used, equal quantities of air and ether-vapor.

A graduated bottle, such as that devised by Holtzclaw (see next page), is advantageous. In the ground-glass stopper there are, on opposite sides, two grooves extending about half the length of the stopper. When wanted for use, the stopper is turned so that its grooves come in apposition with the air-hole on one side and with the groove in the neck on the other. This adjustment can be so regulated as to permit a stream to

flow or only a drop every two or three seconds. When not in use the stopper is turned half-way around.

A combination of inhaler and graduated bottle has been contributed by Rosenberg, the construction of which can readily be understood by the illustration shown on the opposite page.

Another excellent combination instrument is that of Vulpus, shown in the illustration on the opposite page.

The preliminary application of a 5-per-cent. solution of cocaine by means of an atomizer (a few puffs being sufficient) is of importance, as already stated, to avoid the reflex influence of the nasal nerve-supply, or a little nitrous oxide may be given for the same purpose—an excellent method, according to Dudley Buxton.

Suggestion that patient be allowed to smell at the ether-bottle or inhale from the inhaler, holding it away from the face with his own hands. This preliminary step produces anaesthesia of the pharyngeal mucous membrane, and overcomes the feeling of suffocation and inclination to cough which so often mark the initial stage of etherization. Rushmore (*Jour. Amer. Med. Assoc.*, Mar. 19, '92).

When ether is mixed with twice its volume of a bland, light preparation of liquid petrolatum and thoroughly nebulized with a suitable atomizer, it is absolutely unirritating. A few puffs of the mixture from the atomizer directly into the nostrils, before administering ether in the usual way, followed by happy results. D. H. Ludlow (*Phila. Polyclinic*, Feb. 8, '96).

In 1500 cases of ether administration which had been preceded by nitrous-oxide gas there had been only 1 case of bronchitis, 1 of pneumonia, and 4 of slight bronchial irritation. These 1500 cases included every variety of surgical operation, and were in no way selected; some had albumin in the urine, 4 had small quantities of sugar, and several

had cardiac disease. Sidney Rumboll (*Lancet*, Feb. 10, 1900).

Ether given after preliminary narcosis with nitrous oxide offers the following advantages: Safety, saving of time to the operator, and elimination of the disagreeable features of ether-inhalation. The patients recover more promptly; nausea and vomiting are of shorter duration. The quantity of ether required is often less than half that generally used. Carter (*Med. News*, Apr. 14, 1900).

Ethyl-bromide used before ether anaesthesia to a strong, alcoholic, and violently-struggling patient. With the first breath of the ethyl-bromide the struggling ceased. The patient was then

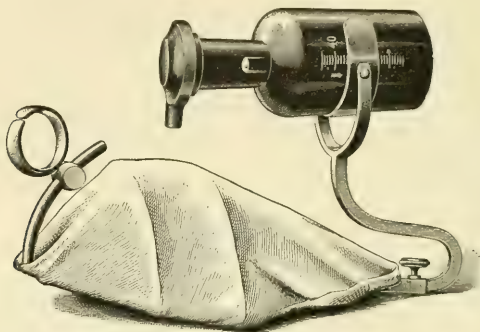


Graduated dropper. (*Holtzclaw, Medical Record.*)

gently laid recumbent, and in twenty seconds he was completely and deeply anaesthetized, and all reflexes abolished except the pupillary light reflex. Then ether was administered from a second cone. Experience in over one hundred cases shows the following to be the best method: 1 or 2 drachms of the drug are poured on the distributor of a partially-closed cone inhaler, which is closely applied, and when sufficient anaesthesia has been attained,—i.e., in from thirty to forty-five seconds (rarely a second dose is needed),—ether is given slowly by the drop method in the usual way through a slit in the cone. Fowler (*N. Y. Med. Jour.*, Apr. 28, 1900).

The administration, previous to the ether, of a subcutaneous injection of $\frac{1}{6}$ grain of morphine and $\frac{1}{120}$ grain of atropine sulphate has also been recommended.

ether upon the towel, cone, or inhaler used, the latter should be held some distance from the face, taking care to avoid gagging the patient. "Air" slightly impregnated with ether should be the first



Inhaler-mask and dropper. (Rosenberg, *Centralblatt für Chirurgie*.)

Administration.—When ether is to be administered, the patient should be well covered, to prevent lowering of temperature, and his body should be protected against chilling by the judicious appli-

rule, and "ether impregnated with air" the second; but the latter is only applicable when the patient's membranes have become tolerant of the action of the ether. When this stage is reached, how-



Modification of Junker inhaler. (Vulpinus, *New York Medical Journal*.)

cation of towels over the parts that would otherwise become moistened by the antiseptic solutions used in connection with the operation.

After pouring a small quantity of

ever, the agent may be pushed until the ether-vapor is inhaled with as small a quantity of air as the instrument used will admit when applied close to the face.

Important in this connection is the

fact that ether-vapor is irritating to the eyes; this untoward effect may be prevented by placing a wet compress over them as soon as the patient is beginning to show signs of anæsthesia. If done at first this procedure is apt to cause apprehension and the fumes are sufficiently condensed to cause irritation only when the inhaler is close to the face—though not against it. To protect the skin of the face, a little cosmolin applied over it is very efficient.

The effects produced by ether may be divided into three stages:—

1. A stage in which the patient shows symptoms of mental confusion; the pulse is increased in strength and rapidity, and the respiration is accelerated. There is usually some lividity, a few unconscious muscular movements, and rambling words. Spoken to loudly, however, he may understand what is said and respond. The patient may be hilarious soon after the administration of the anæsthetic is begun, but the exhilaration usually marks the advent of the second stage. At this time occurs a period of "primary anæsthesia," during which certain small rapid operations, such as opening an abscess, can be performed.

2. The second stage is one of excitement. The patient acts, especially if the ether be given too rapidly, as if he were intoxicated, and endeavors to free himself from the attendants, who are obliged to hold him. He tries to remove the towel, cone, or inhaler, and to rise. Hallucinations are frequent during this stage, and, when ether is administered to a woman, a third party should invariably be present. These symptoms are less likely to occur if the anæsthetic is administered in the manner indicated above.

Auto-etherization used for twenty-five years. It increases safety and adds

to the comfort of the patient. The patient assumes a sitting posture and etherizes himself in this position, which prevents embarrassment to breathing. The cone employed is made of leather and packed with cotton-wool. From 1½ to 2 ounces of ether is poured into the cone, which is handed to the patient with instructions to apply it closely to the nose and mouth and to take long, full breaths; if the vapor be too strong or a sensation of choking be experienced the patient is allowed to withdraw the cone. When the patient's hands drop, a brief operation may be performed or the anæsthetizer may take the cone and continue the etherization. F. Buller (*Montreal Med. Jour.*, Nov., 1902).

Vertigo, tinnitus, and deafness, gradually followed by a feeling of heaviness, are experienced by the patient, who then passes into the third stage, that in which all consciousness has ceased to exist. During this stage there is no excitement, the breathing is regular and there may be snoring. When this is the case, however, the head should be turned to one side so as to cause the uvula to drop sidewise and increase the size of the passage. The skin is moist and the face is red and suffused. The muscles are relaxed, the arm dropping when raised.

In operations upon the nose, throat, and ear personal method consists in bringing the patient partially under the anæsthetic, as usual, and then placing him in the specially devised chair used, and gradually bringing the latter from a position of being tilted far back to an upright position, the patient being fastened to the chair. By the time the upright position is reached the patient is sufficiently under the anæsthetic for the operation to begin. No bad results have been experienced, and the writer claims for the upright position the three-fold advantage of reduction in amount of blood lost; better naso-pharyngeal drainage, thereby lessening the liability to ear complications; and finally the ease, thoroughness, and accuracy with which

operations can be done. T. R. French (N. Y. Med. Jour., Oct. 13, 1900).

Dose.—The quantity utilized cannot be established upon a fixed rule; but $\frac{1}{2}$ to 1 ounce is usually employed during the first two stages. Small quantities poured from time to time upon the inhaler are necessary to keep the patient "under." The intervals are necessarily shortened when operations about the rectum, vagina, or urethra are being performed, which seem to cause return to consciousness sooner than when other regions are being submitted to active procedures.

The following method is of very great service in estimating the degree of anæsthesia in infants and children: The index finger should be placed in the infant's hand; during the earlier part of the administration the finger is grasped very tightly, the palmar reflex being active; but, as insensibility approaches, the infant's fingers gradually relax, and as soon as they become loose the operation may be commenced. In the infant the anesthetizer should devote his constant attention to the amount of palmar and digital reflex action present. Care should be taken against cold air being breathed for several hours after the operation. F. Woodhouse Barine (Practitioner, Oct., '96).

The drop method first suggested by Witzel, employed with success in 120 cases. The ether is given in such small amounts that after-effects are not seen. In all cases the urine was examined for several days without finding a trace of albumin. The recovery in every instance was rapid. The method is briefly as follows: The patient is directed to count backward from 200, so as to stimulate deep respirations. The ether is then dropped very slowly on a Schimmelbusch or Esmarch mask, and after a certain degree of narcosis is attained, taking from ten to twenty minutes, a few drops of chloroform are given until the corneal reflex is abolished. The ether is then resumed and the chloroform may also be again given, a few

drops at a time, whenever the patient appears to become restless. The patient's head should be kept low and bent sharply backward. When the chloroform is added, it is claimed that the heart is already stimulated and strengthened by the ether and so better able to resist the effects of this drug. F. Berndt (Münch. med. Wochen., May 19, 1903).

Contra-indications.—The main toxic effects of ether involving the respiratory centres, any disease of the respiratory tract is thought to reduce the safety of anæsthesia in proportion with the degree of involvement. It is probable that the respiratory centres are influenced in both ways: reflexly at the start through the nasal nerve-supply, or, later on, in subjects suffering from stenotic disorders of the respiratory tract, as a result of the toxæmia through undue exposure of the pulmonary area to the effects of ether. Hence, all conditions tending to reduce the diameter of the trachea or the bronchial tubes, goitre, asthma, bronchitis, etc., are to be looked upon as compromising factors. The Trendelenburg position, considerably used at present, is dangerous, through the pressure exerted upon the diaphragm by the intestines.

Ether is contra-indicated in operations within the mouth and upon or close to the air-passages; certain conditions of the lungs, particularly acute bronchitis, asthma, double empyema; advanced renal disease and diabetes; operations demanding the use of the actual or thermocautery upon or close to the face. J. B. Blake (Boston Med. and Surg. Jour., June 6, '95).

The writer has had 9289 cases of etherization in twenty-five years, and has not had a single death. Only thrice has he had to do artificial respiration, and always successfully. He has never seen broncho-pulmonary accidents imputable to ether, and believes that the majority of pneumonias attributed to ether are really infectious pneumonias. Certainly there are contra-indications to etherization—e.g., lesions of the respira-

tory tract, operations on the face, etc. Julliard (*La Semaine Médicale*, Oct. 22, 1903).

Organic heart disease is not looked upon now with as much dread as formerly, but when the cardiac disorder is sufficiently advanced to cause dyspnoea or oedema, or when there is concomitant and marked asthenia, the circulatory system may quickly succumb as a secondary result of the respiratory paresis. The presence of arteriosclerosis is not thought to increase the danger; but all such cases should be closely watched.

Arteriosclerosis does not constitute a contra-indication for the use of ether. The deaths by chloroform occur, in the majority of cases, in young, robust, and healthy persons before complete chloroform narcosis is obtained. Ether deaths are met with usually in persons over 50 years of age, and are generally accounted for by lesions found at the autopsy. Robert Weir (*N. Y. Med. Jour.*, Mar. 1, '90).

Post-mortem appearances in a series of deaths during ether anaesthesia: Extensive disease of the heart found in 5 cases; in 3, death from cardiac syncope was reported, and the autopsy revealed extensive pulmonary disease, in 1 case coupled with morbus cordis. In 6 cases death took place before the operation, in 2 during, and in 2 immediately afterward. Of the deaths under ether, 2 occurred in persons exhausted by constant vomiting, due to intestinal obstruction, 1 from apparent cardiac syncope, the patient being a confirmed drunkard and in delirium tremens at time of operation. The death under "gas and ether" was that of a very anæmic, weakly woman. R. Williams (*Med. Chronicle*, p. 150, '93).

In 15,000 etherizations but two deaths. In the one case a tubercular infant in a depraved state of health died from asphyxia. The necropsy showed advanced apertic disease and disseminated tuberculosis. In the second case an anæmic woman was, after the operation, placed in the sitting posture while being carried to her bed. Although apparently rallying under restorative measures, she

died in the night from symptoms of progressive nervous exhaustion. Over-vigorous attempts at artificial respiration seem to have done this patient grievous harm. Poncet (*Annual*, '95).

Case of man in good health to whom ether was administered in order to break up adhesions. Operation was completed, and administration of ether stopped. The patient breathing stertorously and well, like one recovering from ether. Corneal reflex tried and found present. About half an hour after administration of any ether, breathing noticed to be in gasps, and patient blue in the face. Death followed immediately.

At post-mortem intense venous congestion the only abnormal sign found. H. Hammond Smith (*Brit. Med. Jour.*, Jan. 8, '98).

Case of death from ether anaesthesia. The patient had a compound fracture of the forearm, which exposed the wrist- and elbow-joints, accompanied by rather extensive laceration of the muscles of that member. The autopsy showed interstitial myocarditis of moderate degree, complicating functional cardiac hypertrophy; chronic arteriosclerosis of marked degree in the aorta, but not extending to the smaller vessels, excepting those of the heart; submeningeal oedema of slight extent, limited to the cerebral vertex; pigmentation of the ganglion-cells of the cerebral cortex, and a similar condition of the cells along the floor of the fourth ventricle. H. Brooks (*Med. Record*, Nov. 9, 1901).

Advanced kidney disease is a radical contra-indication to the use of ether, especially since ether-pneumonia has been attributed to the renal insufficiency. Albuminuria, if not marked, does not seem to compromise the result.

In ether anaesthesia the kidney becomes congested, and on microscopical examination the cells show cloudy swelling. The cells of the convoluted tubules are primarily affected, the tufts and collecting tubules only evincing change when the anaesthesia has been prolonged. The local effect of ether is deleterious to

an already diseased kidney. In cases of nephritis ether should be given only with the greatest care, continually watching for any signs of failure of the respiration. George B. Wood (Univ. Med. Mag., Sept., '94).

Ether and chloroform act as poisons, causing degenerative, inflammatory, or necrotic processes, sufficient, in organs previously weakened, to bring about cessation of their functional activity. Parasporo (Il Policlinico, Dec., '97).

Many surgeons prefer chloroform to ether when children are to be anæsthetized, but this preference is not based on good ground, all things being equal. Pneumonia is no more likely to occur than under chloroform, if care be taken to avoid undue exposure of the body during and after the administration of ether.

Ether is to be employed with preference in infants. St. Germain states that he has chloroformed 6000 infants without a single death. For the same period of life—*i.e.*, up to 12 years—there is not one death recorded from ether, while from chloroform there are 21 deaths found in literature. R. Weir (N. Y. Med. Jour., Mar. 1, '90).

During ether anæsthesia the temperature falls. The variation in temperature is much more marked at first than subsequently. The fall continues, though slightly, during deep sleep after anæsthesia. The temperature begins to rise at the moment of waking, and proceeds in an inverse ratio to the fall, so that the variation becomes more and more marked in proportion as the patient gets more thoroughly awake.

This lowering is due to the fact that ether determines well-marked vasodilatation, loss of heat naturally following. Angelesco (Medical Week, Dec. 14, '94).

The effect of ether inhalations upon the lungs is a double one: (1) the pulmonary vessels lose their tone and dilate; (2) their walls become more pervious, and hence œdema results. Without cardiac weakness the œdema cannot become dangerous. W. Lindemann (Centralb. f. Path., 11-12, '98).

Untoward Effects.—During ether anæsthetization the most frequent untoward feature is retching and vomiting, even when proper precautions have been taken to insure an empty stomach. It is often due, according to Buxton, to swallowing of mucus and saliva impregnated with ether, but the liquid regurgitated is often mixed with bile. The patient's head should be gently tilted to one side so as to cause the fluid to vacate the air-passages, the mouth being opened with the gag if necessary; the liquids remaining in the mouth are swabbed out with a small sponge held with forceps. The vomiting is of no importance in itself; it is of vast importance, however, if the freedom of the air-passages is not borne in mind, since the aspiration of some of the ejected substances may cause asphyxia. When the mouth is opened and cleared, it is well to draw the tongue with the fingers (protected by a napkin) so as to facilitate the passage of air through the larynx by raising the epiglottis. If any asphyxia show itself, Laborde's method—rhythmic tractions of the tongue eighteen times a minute—is to be practiced. Vomiting unattended by other untoward symptoms does not preclude continuation of the ether.

Sixty-three cases of asphyxia due to various causes restored by rhythmic traction of the tongue. Laborde ("Les Tractions Rhythmiques de la Langue," Paris, '94).

For the salivation, atropine has been found to be an excellent preventive. Three-quarters to one hour before the anæsthetization an hypodermic is given of the following solution:—

R Atropine sulphate, $\frac{1}{10}$ grain.
Morphine hydrochlorate, 3 grains.
Distilled water, $2\frac{1}{2}$ drachms.

The dose to be injected varies, with the condition and the age of the patient, from 8 to 16 minims, which represent about: atropine, $\frac{1}{120}$ to $\frac{1}{80}$ grain, and

morphine, $\frac{1}{6}$ to $\frac{1}{4}$, grain. W. Reinhard (Therap. Monats., May, 1901).

Usually, quickened breathing indicates a too-shallow zone of anæsthesia, requiring more ether. Respiration, color, and the pupil should always be watched. Any cyanosis renders it imperative to give the patient more air.

Failure of the respiration is shown by lividity of the face and other evident signs. The pupils are dilated and the lips blue; cardiac failure may follow or manifest itself suddenly before the respiration ceases, but, ether being a cardiac stimulant, this very rarely occurs, and almost all the deaths that have taken place have been due to preliminary lung disease or to some organic disorder involving the respiratory tract.

Treatment of Ether Collapse.—Arrest of respiration calls for the immediate injection of $\frac{1}{20}$ grain of strychnine and of 10 minims of the fluid extract of digitalis, supplemented by rectal injections of warm coffee. Cardiac failure is best counteracted by means of atropine sulphate: $\frac{1}{120}$ grain given hypodermically. The Sylvester should at once be instituted, and the indications given under CHLOROFORM (volume ii) resorted to if prompt results are not obtained.

Case of total respiratory failure from ether following an operation for appendicitis. Artificial respiration was practiced for over four hours, and various stimulants were also used, followed by recovery. The only agents which seemed to be of service were artificial respiration and the adrenalin chloride. Discontinuance of artificial respiration always produced cyanosis. Renewed efforts restored the color of the skin. To the adrenalin chloride belongs the greater part of the credit of resuscitation. It lowered the beat of the heart to nearly normal and increased its power and volume. At no time after the first dose of 30 minims did the action of the

heart fail. It was administered the day after the operation in doses of 10 drops every two hours. This drug, in the writer's experience, is the one valuable thing in cases of cardiac failure from shock and hæmorrhage. H. H. Everett (Medical Record, May 23, 1903).

After-effects.—Vomiting is a very common after-effect of ether anæsthesia. It is rarely persistent. A mixture of 4 to 5 drops of chloroform with 2 to 3 drops of vinegar of opium is recommended by Buxton. Inhalations of strong vinegar-fumes (or acetic acid) sometimes act promptly.

[A minimum quantity of ether has more to do with the lessening of ether vomiting than has the atropine. The two important points in this connection are: (1) care must be taken that the patient does not swallow mucus and saliva impregnated with ether; (2) he must not be lifted and moved about while he is under ether. With some persons, however, severe vomiting will take place whatever precautions are adopted. DUDLEY BUXTON, Assoc. Ed., Annual, '96.]

Oxygen has a positive value in shortening the time of returning consciousness and in diminishing the unpleasant after-effects of ether. It is a good cardiac and respiratory stimulant and is indicated in threatened collapse. J. B. Blake (Boston Med. and Surg. Jour., Nov. 12, '96).

The most satisfactory method of controlling nausea and vomiting after anæsthesia is the administration of strong vinegar by inhalation. A towel or cloth, saturated with fresh, strong vinegar, is held a few inches above the patient's face, or hung from the bedstead, so that it will be near his head. It should be used directly after the anæsthetic has been discontinued, and kept up continuously for hours. J. T. Rugh (Dunglison's College and Clin. Record, Apr., '98).

Ether-pneumonia may be caused by direct exposure to the surrounding air, while the powers of resistance of the system are reduced as a result of the opera-

tion and of the physiological effects of the anæsthetic. The temperature is generally reduced from $\frac{1}{2}$ to 1 degree by the evaporation from the lungs, and exposure, especially when any portion of the body is wet, that would under other circumstances produce no evil effect, now becomes dangerous. Important also is the quality of the ether employed. Remnants from partially-emptied bottles should never be used.

It is very important, as has repeatedly been shown in this article, to keep the patient warm while he is under the anæsthetic and afterward. He should be wrapped in blankets, and hot-water bottles should be placed around him.

Among other complications of ether anæsthesia are mental excitement and nervous phenomena of various kinds. These, however, promptly disappear in practically all cases under symptomatic treatment.

The fact that ether is easily ignited should always be borne in mind.

The writer reports the following unusual experience: "On the 19th of January, while engaged in a tedious and difficult operation at one of the hospitals in the city, my attention was taken from my work by a sudden flash of light and some quick movements on the part of the anæsthetist, and I found that the ether vapor had ignited, scorching the hair and eyebrows of the patient, and had burned the skin on his forehead sufficiently to cause quite a marked redness. The anæsthetist reported that the patient being on the face, he was unable to see the pupil properly, and he had turned on the electric light in order that he might more readily note the reaction of the pupil. The blaze had resulted coincidentally with the turning on of the light. There was no exposed fire or blaze in any part of the operating room, and the only conclusion that we could arrive at was that the vapor of ether had ignited from the spark in the electric light burner made when con-

tact took place in the turning on of the light. I had never seen reported or heard of such accident taking place during the administration of ether, and may occur again. This being the case it is well for any surgeon or anæsthetist not to turn electric lights on or off near the vapor of ether, particularly when the room is small and there is a large amount of the vapor of ether in the room, as one can easily see what serious damage might result.

"I would also state that it is not so easy to produce a blaze by the turning on of an electric light in the presence of ether when we try it for that purpose. Since this occurrence, I have tried the experiment several different times in different ways, with the same burner and others, and have been unable to produce a blaze with ether vapor; so that, while it is possible that this experience may be unique, and is certainly of rare occurrence if not unique, yet every surgeon and anæsthetist should bear in mind the fact that it has occurred. Fortunately, in this case the anæsthetist was prompt in his actions, and no damage was done, but very serious consequences might easily have resulted if the anæsthetist had lost his head. D. H. Murray (N. Y. Med. Jour. and Phila. Med. Jour., Consolidated, June 27, 1903).

Local Anæsthesia.—Local anæsthesia may be obtained by means of a spray of ether, which acts by causing intense cold of the surface by evaporation. It is a useful procedure for minor surgical operations, especially for the opening of abscesses. It has been also used for major operations, but is far inferior to other methods.

Therapeutics of Ether.—Hypodermically, ether is of value in the treatment of many conditions. Its widest application is in the treatment of shock, sinking-spells, collapse, cardiac failure, and convulsions. Ten to 15 drops hypodermically, or more in strong adults, is

sometimes followed by prompt reaction. It is also valuable in asthma, hiccough, and other spasmodic neuroses, and in hysteria, neuralgia, and migraine. Thirty to 80 minims in ice-cold water or in capsules, followed by a mouthful of water, are promptly effective in most cases. It has also been used by rectal injection, but the local irritation produced counterbalances its advantages.

ETHMOIDITIS. See SINUSES, DISEASES OF.

ETHYL-CHLORIDE. — Chloride of ethyl (mono-chlor-ethane) is a gas at ordinary temperatures, but when compressed it becomes a colorless, very inflammable liquid, boiling at 54° F. When ignited it burns with a green flame. It has an aromatic, sweet taste and an ethereal odor. It is exceedingly volatile, which latter property renders it unfit for genuine anæsthesia.

Dose and Physiological Action.—For internal use it has been given in doses of 10 to 30 drops dissolved in an equal quantity of alcohol. When thus taken it has a stimulating action. When ethyl-chloride is inhaled its chief effect appears upon the circulation and respiration, there being a marked lowering of the pulse-rate and the blood-pressure; the respirations are at first increased in depth and frequency. Tonic doses cause cessation of cardiac and respiratory movements. Sprayed on skin or mucous membrane, it causes them to become white, cold, and insensitve.

Poisoning by Ethyl-chloride.—Ethyl-chloride inhaled in tonic doses produces poisonous effects similar to those of chloroform, but is less of a cardiac depressant. Death results from paralysis of the respiratory centres and the heart.

Treatment of Poisoning by Ethyl-

chloride.—When poisoning has been induced by inhalation, the tongue should be drawn forward, and caffeine, strychnine, or atropine given by hypodermic injection. Artificial respiration should be used faithfully, the head being lowered as in chloroform syncope. Amylnitrite, ammonia, and warmth are also useful.

Therapeutics. — While ethyl-chloride has been given continually as a stimulant, its use is not advised, as other equally-efficient stimulants are available which are free from danger. We would also warn against its use for the purpose of inducing general anæsthesia, as the dangers incurred therefrom are too great. The legitimate field of usefulness of ethyl-chloride lies in the production of local anæsthesia for the relief of pain and for the purpose of performing minor surgical operations in dental surgery.

Ethyl-chloride used in 1263 operations and to the skin alone in 503 cases. The local anæsthetic was combined with moderate chloroform narcosis in 393 cases. Study of the sensibility of the various tissues showed that practically all sensation of pain was confined to the skin, where incisions are made with a sharp knife. Most of the deeper structures are easily incised without pain with a sharp knife, pain being only caused by stretching or pulling apart of the tissues. Bloch (St. Paul Med. Jour., Jan., 1900).

Ethyl-chloride used as a general anæsthetic in 400 cases in von Hacker's clinic at Innsbruck. Complete anæsthesia is induced in from a half to two minutes, according to the age of the patient and the amount of alcohol he is used to drink; a stage of excitement is observed only in alcoholic subjects; symptoms of heart-failure or of disturbed respiration are never seen, and the tongue has no tendency to fall backward; consciousness returns directly the mask is removed from the face, and unpleasant sequelæ, such as headache or vomiting, are ex-

tremely rare. Though most suitable for short operations, ethyl-chloride has been employed of late successfully in operations lasting as long as fifty minutes. It is especially valuable in cases with serious circulatory troubles, fatty degeneration of the heart, and respiratory diseases, where it is inadvisable to give chloroform or ether, and in shock or after copious hæmorrhage. When anæsthesia is complete the pupil and corneal reflexes usually persist. Wiesner (Wiener med. Woch., July 8, '99).

Series of experiments upon eleven dogs and the use of ethyl-chloride as a general anæsthetic in seven hundred cases, patients ranging from two months to sixty years of age, showed that the use of this drug is simple, rapid, and not dangerous. It is given upon a few layers of gauze. Narcosis follows in from ten to fifteen seconds. If the operation is to last some time, chloroform can then be used. Muscular relaxation, regular respiration, and decreased arterial tension are noted. The pulse-rate rapidly decreases with the tension, during the narcosis, and increases when the patient comes to. The liver and kidneys seem affected in spite of the short anæsthesia, albumin and bile-pigment appearing in the urine after anæsthesia. Mentally this narcosis resembles the coma of the last stages of alcoholic intoxication. It is especially indicated for short operations. It is also an excellent method with which to begin chloroformization. A. Malherbe and J. Roubinovitch (Le Bull. Méd., June 11, 1902).

LOCAL ANÆSTHESIA.—Ethyl-chloride is usually dispensed in large tubes, one end of which is drawn out to a fine point, or in tubes closed by an automatic cap. When the former are used, the point is broken off, and the tube held in the hand, at a distance of from six to ten inches from the part to be anæsthetized. The heat of the hand causes the liquefied gas to issue in spray-form. By its rapid vaporization the part soon becomes frozen and ready for operation. As the

skin hardens under the ethyl-chloride the exact limits of the operation must be determined beforehand. The highly-inflammable nature of this agent must be remembered, and operations must be done at a good distance from gas and other flames or by electric light. The absence of unpleasant after-effects and of any influence on the sensory centres of the brain are its advantages over some other agents used for local anæsthesia. It is used in the treatment of ingrowing toe-nail, the opening of abscesses, removal of ganglia, or for any painful skin-incision. If the liquid is ignited as it issues from the broken tip, the flame thus produced may be used to cauterize septic or aseptic wounds or for cutaneous cauterization.

NEURALGIA.—Ethyl-chloride in spray has been used with success in supra-orbital and facial neuralgia, sciatica, neuralgia of the breast, upon the painful joints of incipient gout, scrotal pruritus (diabetic), and in migraine. From 2 ¹/₂ to 5 drachms may be used in spray at one sitting, the lesser quantity usually being sufficient.

C. SUMNER WITHERSTINE,
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EUCALYPTUS.—Eucalyptus U. S. P. is the leaves from the older parts of the *Eucalyptus globulus labillardiere*. The eucalyptus, or blue-gum tree, is a tall, evergreen tree, a native of Australia, but now grown all over the world. From the leaves the oil of eucalyptus is obtained by distillation, and from this oil by redistillation with caustic potash or calcium chloride a camphoraceous body is obtained which is known as "eucalyptol." The latter is the refined product.

It was once thought that as the tree grew easily in marshy districts and drained the soil of water, it would diminish the malarial miasm of low swampy

regions, and in that way prove a prophylactic against malaria. Laveran has shown, however, that the organism causing malarial troubles is, in all probability, taken into the body through the media of food and drink, and that the planting of the eucalyptus-trees does not diminish the paludal fevers. The prevailing view that mosquitoes are the main intermediaries through which the infection occurs also tends to diminish faith in eucalyptus as a prophylactic.

The leaves have a camphoraceous odor and a pungent, bitter taste, and yield a volatile essential oil, the oil of eucalyptus, which is the active principle. Eucalyptus-oil is a faint-yellow, sometimes colorless liquid, having a characteristic aromatic odor and a pungent, cooling taste, and being soluble in alcohol and in bisulphide of carbon. The value of the oil depends upon the amount of eucalyptol present.

Eucalyptol is a colorless liquid, with strong aromatic camphoraceous odor; is slightly soluble in water, but easily soluble in alcohol, ether, and fatty oils.

By treating oil of eucalyptus with hydrochloric acid Anthoire has obtained a white, micaceous, scaly substance, hygroscopic in nature, called eucalypteol. It is soluble in alcohol, ether, chloroform, and oils, but almost insoluble in water and in glycerin. It is not poisonous, and is tolerated by the stomach.

Preparations and Dose.—Eucalyptus, $\frac{1}{2}$ to 2 drachms.

Extractum eucalypti fluidum, 10 drops to 2 drachms.

Oleum eucalypti, 5 to 20 minims.

Eucalyptol, 1 to 15 minims.

Eucalypteol, 24 grains daily, in divided doses.

Physiological Action.—Applied externally, the oil is a decided irritant, and causes heat and redness of the part, due

to dilatation. When inhaled it causes an increase of the saliva and of the bronchial secretion. When taken internally in medicinal doses it produces a feeling of warmth and stimulation, with increased secretions, while larger doses are productive of disordered digestion, diarrhoea with loose stools having the characteristic odor of the oil, and symptoms of renal and cerebral congestion and force. The pulse is increased in frequency. In larger doses there are noticed a rapid, weak pulse, general excitation, and restlessness; decrease of body-heat, lower arterial pressure, irregular and weak respirations; muscular weakness, especially of the lower limbs; and death from respiratory paralysis. The drug is eliminated by the bronchial mucous membranes, the skin, the kidneys, and the bowels. The urine may have the odor of violets, as noticed after the ingestion of the oil of turpentine. The oil of eucalyptus, like most aromatic oils, is an antiseptic and a germicide, and in sufficient strength it inhibits the growth of micro-organisms in culture-media. Eucalyptus is a powerful diuretic. An increased excretion of urine is said to follow its internal use.

Poisoning by Eucalyptus.—Tonic doses of eucalyptus give rise to the symptoms of gastro-intestinal irritation, renal and cerebral congestion, impaired circulation, muscular weakness and paralysis, and finally death by respiratory failure. Cases of poisoning are not frequent.

Case of poisoning in which between 2 and 3 teaspoonfuls of oil of eucalyptus had been swallowed. The severe stupor, myosis, and hypothermia which followed suggested opium poisoning. Stertorous breathing, however, was absent. Recovery. F. C. Wood (Brit. Med. Jour., Jan. 27, 1900).

Treatment of Poisoning by Eucalyptus.—In mild cases the gastro-intestinal

symptoms should be ameliorated through the use of morphine, bismuth, lime-water, etc. In severe cases, when the circulation and respiration are profoundly affected, the use of caffeine, strychnine, and atropine by hypodermic injection is advised.

Therapeutics.—Eucalyptus has a selective action upon the mucous membranes, being excreted through them. To them it is a stimulant, antiseptic, germicide, and antispasmodic, and we find that its most beneficial action is exerted, therefore, directly upon the gastro-intestinal tract, the bronchial tubes, and the genito-urinary tract; indirectly upon certain mucous disorders more or less dependent upon the integrity of tissues and function of those organs. In general, it is contra-indicated in acute inflammatory conditions.

GASTRO-INTESTINAL DISORDERS.—In atonic dyspepsia and chronic gastric or intestinal catarrh, eucalyptus is one of the most useful stomachics. In convalescence from acute disease and in debility from defective assimilation it is a useful stimulant and tonic. In the flatulence, cardiac palpitation, and hot flashes of the menopause it is often of permanent benefit. It has been found useful in cholera, 5 minims being given in milk every quarter-hour for one hour, then every hour. On account of its antiseptic action, eucalyptus-oil and eucalyptol have been used in typhoid fever, being administered in capsules.

BRONCHIAL DISORDERS.—In subacute and chronic bronchitis eucalyptus loosens the secretions, stimulates and gives tone to the mucous membrane, and exerts, withal, an antiseptic action, especially in cases accompanied by free mucopurulent secretion. It is also useful in bronchorrhœa.

GENITO-URINARY DISORDERS.—In chronic cystitis, pyelonephritis, and chronic desquamative nephritis eucalyptus has been recommended as an efficient remedy. In subacute gonorrhœa Hare advises 6 minims each of eucalyptus-oil and sweet-almond oil in a capsule after meals.

MALARIAL FEVERS.—Eucalyptus has been praised as a remedy for intermittent fever, in the absence of quinine or where idiosyncrasy interdicts its use. It cannot take the place of quinine to arrest the paroxysms, or to prevent relapses at the septenary periods, but is more useful than quinine to reconstruct the damages in the organs of assimilation caused by malarial infection. (Bartholow.)

NERVOUS DISORDERS.—Spasmodic asthma is much relieved by eucalyptol given by steam-inhalation. Cigarettes made from eucalyptus-leaves alone, combined with stramonium, belladonna, tobacco, etc., give similar relief. Pertussis has been relieved by a mixture of 1 part each of eucalyptus-oil and terebene, and 6 parts of alcohol, used in spray half an hour before meals and at bed-time (Haddwicke). Malarial or congestive headache may be relieved by oil of eucalyptus, 5 minims being given four or six times daily.

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EUROPHEN.—Europhen, or iodo-di-iso-butyl-ortho-cresol, is the result of the action of iodine on iso-butyl-alcohol and ortho-cresol with zinc chloride by heat (Merck). It is allied to aristol and appears as a light, dull-yellow, amorphous, aromatic powder, which is soluble in alcohol, ether, chloroform, and oils, but insoluble in glycerin or water. It has an aromatic odor, like saffron, but has no taste. It is stable when kept dry. On

prolonged exposure to moisture it is decomposed, setting free nascent iodine. If heated to 158° F. in the presence of water it is decomposed; hence heat should not be employed in making solutions of it. It contains 28.1° of iodine (Merck). It was introduced as a substitute for iodoform. Europhen is incompatible with the metallic oxides, all preparations of mercury, and starch.

Dose and Physiological Action.—Internally the dose is 1 to 3 grains. By hypodermic injection (in a 3-per-cent. to 10-per-cent. solution in olive-oil) the dose is 1 to 1½ grains, once daily. Externally, it is used in 5-per-cent. to 10-per-cent. ointment, dissolved in olive-oil or lanolin (5 per cent. to 30 per cent.), as a dusting-powder (1 part to 3 of boric acid), in 10-per-cent. gauze, or pure.

The therapeutic value of europhen depends upon the liberation of iodine when it is exposed to moisture. In this its action is similar to that of iodoform; but europhen parts with its iodine more slowly, even under the most favorable conditions; and while it is thus less poisonous than iodoform it is also, for the same reason, less efficient.

Case of gumma of the thigh previously treated with iodoform without ill effects. Europhen was applied and gave rise to a severe exudative erythema of the thigh and a follicular erythema of the leg. R. W. Taylor (Jour. Cut. and Gen.-Urin. Dis., vol. xiii, Dec., '95).

On the other hand, it is more bulky, will go farther, and is less likely to cake than iodoform. Its properties are those of an antiseptic, antisypilitic, and alterative. It exerts a kolyseptic action upon micro-organic growth.

Therapeutics.—Europhen is not generally given by the mouth, although it has been administered in syphilis, in doses of ½ to 2 grains. It is not considered poisonous; as much as 23 grains

has been taken daily for three weeks without any appreciable disturbance. It is believed that europhen taken internally passes through the bowels almost unchanged. The hypodermic use of europhen has not met with much favor, and, although tried in the treatment of syphilis, it has not yielded the results anticipated. As a surgical dressing and in some cutaneous disorders, principally those presenting moist or secreting surfaces, europhen has found great favor.

WOUNDS.—In recent wounds of traumatic origin europhen has proved of great usefulness, showing a high efficiency as an antiseptic dressing. Great drying powers without local irritation and absence of odor are the principal advantage of europhen over iodoform. All kinds of wounds heal quickly under it. It has been used with great success after superficial operations, such as removal of skin tumors, circumcision, and cauterization. In post-operative fistulæ it has been found better than iodoform. Erosions, fissures, and sinuses may be dusted with europhen and then covered with 10-per-cent. europhen gauze.

Europhen recommended as the best substitute for iodoform; it does not irritate inflamed skin. In varicose ulcers, with eczema, europhen is of much value, for it has a beneficial effect on the eczema. It may be applied in powder, either alone or mixed with powdered boric acid. As an application in the intertrigo of children the author recommends:—

R Europhen, 1¼ drachms.

Lanolin. anhydr., 1¼ drachms.

Talc. venet., ad 3 ounces.—M.

It is of much value in pustular affections and folliculitis, in the form of a 10-per-cent. ointment with lanolin, as well as in cases of pemphigus vulgaris and impetigo.

It may be used to replace iodoform in the collodion used for sealing up small operation-wounds. Another advantage

of this preparation is its power of arresting hæmorrhage, which makes it a useful application after the puncture of acne pustules or the scarification of rosacea. Saalfeld (Lewin's Festschrift, Berlin, '96).

R. Europhen,

Castor-oil, of each, 1 part.

Collodion, 10 parts.

M. To be used as an application to wounds. De Molènes (Jour. de Méd. de Paris, Feb. 27, '98).

Experiments with the various newer local antiseptics. Europhen is just as efficacious and entirely free from the objections that frequently attend the use of newer preparations. Its odorlessness and its lightness combine to make it more agreeable and economical to use than iodoform, while in efficacy it is second to none of the agents of its class. Saalfeld (Ther. Monats., xiv, No. 3, p. 139, 1900).

CUTANEOUS DISORDERS.—In skin affections of a dry or scaly character, europhen is inactive, as might be inferred. In dry eczema, favus, and psoriasis its value is slight. As a dusting-powder in the intertrigo of children it has found great favor. In pustular eczema, folliculitis impetigo, suppurating lupus, and scrofuloderma europhen has proved of equal value with iodoform. In scalds and burns and erysipelas it is of considerable service, a dressing of 3 parts of europhen in 7 parts of olive-oil being suggested. In chronic, indolent ulcers and in leg ulcers with a surrounding eczematous area europhen soothes the burning and itching, and allays the pain, whereas iodoform is irritating. Boils and carbuncles are dressed successfully with europhen. In the treatment of tubercular growths europhen is inferior to iodoform.

VENEREAL DISORDERS.—Europhen is a valuable dressing for balanitis, chancre, suppurating buboes, and phagedenic ulcers, as well as for tertiary syph-

ilitic conditions affecting mucous surfaces, or with a moist or secreting surface. Europhen may be applied, as in other surgical cases, in powder, ointment, oily solution, or in the form of gauze, as the nature of the case requires.

NASAL DISORDERS.—In atrophic rhinitis, ozæna, septal ulceration (syphilitic or traumatic), and in post-operative wounds of the nasal cavities europhen is very valuable, as it adheres well to the mucous membrane, is devoid of unpleasant odor, and has great antiseptic and healing powers.

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EXALGIN.—Exalgin (methyl-phenyl-acet-amide or methyl-acetanilid) is prepared by warming together menomethyl-aniline and acetyl-chloride. It appears in beautiful acicular needles, which are with difficulty soluble in cold water, more readily in warm water, and more easily in dilute and concentrated alcohol. It is odorless and tasteless.

Doses and Physiological Action.—Exalgin may be given to adults in doses of 2 to 4 grains every two to four hours. A maximal daily dose of 15 grains should not be exceeded.

Doses of exalgin, as set forth in the various formularies, are too high. The maximum dose for twenty-four hours should be, for a man, 4 grains, and for a woman, 2½ grains. M. Bardet (Jour. de Pharm. et de Chim., No. 8, p. 413, '98).

Children from 1 to 12 years of age may be given ½ to 1½ grains three times daily. Owing to its pleasant taste, it may be given dry on the tongue, in wafers, and dissolved in wine or water, to which a little alcohol has been added (exalgin, 1 part; alcohol, 1¼ parts; sweetened water, 125 parts).

Sodium salicylate added to exalgin in-

creases its solubility for hypodermic use (exalgin, 10 parts; sodium salicylate, 11 parts; water, 100 parts). In short, the dose of exalgin is one-fifth that of antipyrine.

The physiological action of exalgin is similar to that of acetanilid. It is capable of acting energetically upon sensibility and the motor nerve-system, and later upon the respiratory and circulatory systems. In tonic doses it acts upon the blood-corpuscles like all poisons of the same class and diminishes the energy of the gaseous changes therein. In animals, mortally tonic doses produce violent convulsions and insensibility; death is from asphyxia. In tonic non-mortal doses convulsions are observed. In man the temperature is not reduced except when exalgin is administered in small, repeated doses during several hours. It acts first upon sensibility; its action upon thermogenesis comes later and is accessory. With feverish patients untoward effects are accentuated; hence the presence of fever is a contra-indication to its use. While large doses in animals do not produce albuminuria or hæmaturia (Brig-onnet), in man the quantity of urine decreases, the color becomes darker, and urobilin and indican are present, if the dose is large. Arterial pressure occasionally falls slightly, though usually there is a rise, with a decrease in pulse-rate. Vasomotor disturbances are indicated by free or profuse diaphoresis.

Exalgin Poisoning.—No fatal poisoning from exalgin has been reported, although serious symptoms have followed so small a dose as 5 grains. In this case, an asthmatic, the effects of this small dose were noticed within five minutes. Unconsciousness was associated with shallow, infrequent, and failing respiration. The lips and finger-tips became cyanosed and the extremities cold; the

pupils were fixed and widely dilated; knee-jerks were absent. Later an evident tendency to heart-failure. The urine could be drawn with catheter (secretion suppression). In other cases larger doses have produced numbness and tingling, vertigo, temporary blindness, tinnitus aurium, headache, profuse sweating, cyanosis followed by pallor, formication, etc. The brain seems to be the first organ affected and the first to recover. General motor paralysis with dyspnoea, pallor, palpitation, and physical prostration were the symptoms in another case. There is sometimes a feeling of alternate expansion and contraction of the head.

Case of an arthritic and hysterical woman, who took, for the mitigation of an attack of migraine, a cachet containing 4 grains of exalgin. This dose in a short time produced upon the skin and the mucous membrane of the anus and vagina a general papulose eruption, with patches of a fiery-red color, and, in certain spots, large blisters, containing a clear, serous fluid. The rash, which lasted four days, caused pain when pressure was applied, but it was not pruriginous. Linossier (*Jour. de Pharm. et de Chim.*, No. 8, p. 413, '98).

Case of exalgin poisoning occurring in an adult male Chinaman. It was estimated that the dose taken was 150 grains of Merck's preparation. The patient when seen was quite unconscious, intensely livid, with pin-point pupils and a full bounding pulse. His temperature was 100.6° F. He had vomited once. He was given 30 grains of salicylic acid by a nasal tube and $\frac{1}{80}$ grain of atropine hypodermically, and was put to bed. Two hours later he was given $\frac{1}{100}$ grain of atropine, and a few hours later a third dose consisting of $\frac{1}{100}$ grain. The urine contained albumin when first seen, but by the following morning the albumin had disappeared and the patient generally was much improved. Complete recovery ensued. J. Bell (*Lancet*, Sept. 30, '99).

A patient suffering considerably from headache and insomnia received $\frac{1}{2}$ gramme of the drug in the morning; during the afternoon she complained considerably of palpitation of the heart and a feeling of oppression. After subsequent doses of the same size the distress became even more marked and was coupled with formication, vertigo, spots before the eyes, tinnitus, dilation of the pupils, increased pulse rate, and a pronounced cyanosis of the visible mucous membranes. After two days of active treatment with stimulants, warm baths, and diuretics, the symptoms had disappeared. That great care is to be exercised in the administration of exalgin is evident. O. Seifert (Wien. klin. Rundsch., June 29, 1902).

Treatment of Poisoning.—The first indication in the treatment of exalgin poisoning is to evacuate the stomach. Apomorphine in doses of $\frac{1}{10}$ to $\frac{1}{8}$ grain may be given hypodermically for this purpose. Cardiac and respiratory stimulants (ether, strychnine, and caffeine by hypodermic injection, or strong coffee by the rectum) are then demanded. Morphine by injection may be given if there are convulsions or if much rigidity is present. If the respirations fail, artificial respiration should be kept up faithfully, and faradization of the phrenic nerve, stimulants, and warmth applied. In all cases of poisoning thus far reported, these remedies have been successfully used.

Therapeutics.—Exalgin is essentially a remedy against pain, as its name indicates. It is an antineuralgic, antirheumatic, and sedative. It should never be given to patients suffering with any interference of respiration nor used as a means of reducing temperature, for experience has shown that in febrile cases the untoward effects of the drug are marked.

Satisfactory results obtained from the use of the drug as an analgesic in small

doses. Arthur Conning Hartley (*Lancet*, Mar. 7, '91).

Seven cases of various disorders, in which pain was prominent, were markedly relieved by exalgin, the dose of the drug being from 3 to 6 grains. Amelioration was comparatively prompt, and no disagreeable after-effects were observed. C. Ferreira (*Med. Abstract*, Mar., '91).

Used externally diluted, as a dusting-powder, exalgin has been found to exert a slight anæsthetic effect on painful ulcers, burns, and injured surfaces.

Exalgin is used to relieve the pain of rheumatism, arthritis, the various forms of neuralgia, headaches, and the lightening pains of locomotor ataxia.

Exalgin used in various kinds of neuralgias, in the lightning pains of locomotor ataxia, and in those of rheumatism. Doses from 4 to 12 grains have produced no unpleasant symptoms, and when any occurred, such as cyanosis, the duration was short. In some cases as high a dose as 24 grains may be given without producing any cyanosis or other untoward effect. Desnos (*Revue Gén. de Clin. et de Thé.*, Feb. 15, '91).

Small night and morning doses (2 or 3 grains) have been found useful in many cases of epilepsy and chorea, but in these disorders medication must be continued for several weeks to be successful.

In all cases exalgin should be administered in small doses until the susceptibility of the patient is ascertained; thus only will dangerous symptoms be avoided.

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EXOPHTHALMIC GOITRE.—Exophthalmos: Gr., ἐξοφθαλμος, prominent eyes.

Definition.—Exophthalmic goitre, or Graves's disease (called by the Germans Basedow's disease) is a chronic, not self-limited affection, characterized by a great variety of signs and symptoms, the

most familiar of which are enlargement of the thyroid gland, prominence of the eyeballs, nervous irritability, muscular tremor, and vasomotor affections of striking character.

Disorders of metabolism and of local nutrition also occur, and many other manifestations, mainly due to disturbances of the nervous functions, although associated with them are certain signs suggesting morphological disorders of growth, and others of myxædematous-like character.

These signs and symptoms are probably due, for the most part, to a vitiation of the blood by altered and excessive secretion from the thyroid gland, but it is still uncertain whether or not there exist, behind or in conjunction with this disease of the thyroid, some special susceptibility on the part of the nervous system. It is in favor of the latter view that a portion of the manifestations of the disease seem to reproduce, in morbid caricature, an assemblage of quasiphysiological and related functions ("fright-complex," as suggested by Mackenzie and others).

Varieties.—The attempt has been made by various writers to divide the cases of Graves's disease into a "primary," or pure, form, and a "secondary," or symptomatic, form. The symptoms of the latter variety are supposed to be excited—sometimes singly or in small number—by some special source of peripheral irritation, such as disease of the nose or of the genital or intestinal tract, or—and that pre-eminently—by pre-existing goitre of one or another form acting as a mechanical irritant. This view is untenable except in a very limited sense, and introduces a needless confusion into our conception of the nature and symptomatology of Graves's disease.

It is true that cases are now and then met with where the removal of one or another of these special sources of irritation leads to rapid improvement, just as the relief of errors of refraction occasionally leads to rapid improvement in cases of epilepsy or migraine, but to conclude in either case that the true cause of the disease has been found is to follow a misleading method of reasoning. When the nervous system has been under the tax of bearing several loads at once the removal of any one of them may suffice to communicate a new "set" to the nerve-functions or to provide the amount of relief needed to make recovery possible. It is not even safe to conclude, in such a case, that the special irritation in question was originally the sole or principal *exciting* cause of the disease. The most that can be inferred is that it was acting, at the moment of its removal, as a considerable cause of nervous instability, either general or local.

"Secondary" cases of Graves's disease are liable to become as severe and as complex as "primary" cases, and when both are fully developed there is no criterion by which we can distinguish between them. Neither is such a criterion furnished by differences in their modes of onset, since in some of the cases which would be designated as "primary" the symptoms come on very slowly, while, on the other hand, in any class of cases a slow progression or incomplete symptom-complex is liable to give place suddenly to a rapid development.

The differences based on mildness or severity, completeness or incompleteness of the clinical picture, etc., although not of radical importance, and not suited to form a basis for classification, are, nevertheless, of great interest. In some cases the symptoms reach in a few days, or even hours, a degree of development

for which, in other cases, years had been required. Even a fatal ending may occur in the course of days or weeks.

Some of the characteristics especially calling for study are the following: Those indicating an admixture of a true myxœdematous tendency, such as dry skin, non-pitting cedema, possibly falling of the hair, etc.; those indicating formative, morphological modifications of growths, as slenderness of the fingers and suppleness of the joints.

Another point needing investigation is how far the analogy holds good between Graves's disease and the complex of symptoms met with in fright and kindred states. These states may be spoken of as quasiphysiological, but are, in fact, pathological.

Peculiarities of the disease as affecting children; from an analysis of forty-four cases: The symptoms reach their maximum more rapidly in children than in adults; palpitation does not come on so quickly as with adults; thyroid enlargement is always present in children; the exophthalmos is less marked and the eye-muscle symptoms are much less common or severe; choreiform movements are often present, probably as a complication; hysterical symptoms are well marked in some cases. On the whole, the disease is less severe in children. Myxœdema may supervene even with children. Steiner (Wiener med. Bl., p. 91, '97).

Symptoms.—Enlargement of the thyroid usually begins at about the same period with the appearance of the other symptoms, but sometimes much earlier or later. The right lobe is commonly more prominent than the left. Vascular (arterial) murmurs of "swirling" character, obtained by auscultation directly over the gland, are probably pathognomonic when present, but are not always heard; or they may be heard over limited areas. It is doubtful whether enlarge-

ments attended with this special vascular murmur—*i.e.*, enlargements of the specific Graves's-disease character—are ever present for long without other symptoms. This murmur is to be distinguished from the "hum" due to compression of the cervical veins. When one lobe of the thyroid is more enlarged than the other and one eye is also more prominent, there is usually a concurrence as regards right or left side; but marked exceptions to this rule occur, and should be noted. In spite of the presence of these murmurs, and in spite of the fact that the gland is capable of swelling with great rapidity, arterial dilatation is not a marked feature of the post-mortem changes. The characteristic disease consists in changes in form and arrangement of the secreting cells and alteration of the secretion, the exact nature of which latter is not known. This is usually, but perhaps not invariably, attended by enlargement.

From whatever point of view we regard Graves's disease,—*i.e.*, whether as a toxic affection or as a neurosis,—it is clear that the main part of the signs and symptoms, even many of those which are ostensibly limited to other tissues and organs, are referable to disorders of function or, eventually, of nutrition, of the nervous system.

The mental symptoms are excitability; restlessness, often of an agitated character; capriciousness; depression, or, on the contrary, an unnatural gaiety, with an apparent incapacity to appreciate the gravity of the situation; delirium, either in terminal stages of the disease or occurring in paroxysms during its course; typical insanity, and degenerative affections of the brain.

To account for these phenomena we can invoke the influences associated with the disease itself, the neuropathic tend-

encies of the patients, the exhaustion from the sickness, and concurrent influences. In other words, the mental changes may be of parallel significance with the other signs of the disease, or may be only its accompaniments and secondary results; and, the more "specific" their character, the more likely it is that they are essential phenomena of the affection. However the mental symptoms arise, their presence is unfavorable, as increasing the patient's emotional instability.

Changed mental state in cases of Graves's disease noted, especially motor restlessness, which sometimes almost imitates a chorea, and which is present in subacute mania and neurasthenia. Its value is that it expresses their mental attitude as well. They are very subject to fright—often have hallucinations of sight and sometimes of hearing. The memory is usually much impaired. Their mental processes are fragmentary. They have no fixity of attention, and often present a distinct tendency to melancholia. Hysteria and the psychological changes of hysteria are frequently present among them, and in rare cases the disease is marked by the development of acute mania. Maude (*Med. Press*, Sept. 4, '95).

While authorities are uniform in their statement that there is no characteristic psychosis complicating Grave's disease, yet their experience coincides with the author's that in over three-fourths of the cases types of mania are found. The physical symptoms of Grave's disease when accompanied by some mental disturbance are no different than when such a complication does not occur.

Grave's disease is practically always indicative of a neurotic temperament, and the physical and mental symptoms are both evidences of the same neurotic vice. Thus can either scarcely be spoken of as a complication of the other, but rather insanity considered as a further development of the neurasthenic and hysteric conditions observed in even the mildest cases of Grave's disease—the psychosis developing in the more un-

stable. It would seem that while Grave's disease complicates and usually aggravates the mental disease, yet in the average case it does not make the prognosis less favorable. A. W. Rogers (*Medicine*, March, 1904).

Polydipsia, excessive thirst, ravenous desire for food, and other morbid sensations of this complex sort are classifiable here. The sexual feelings are often below the normal.

Epilepsy, hysteria, chorea, and paralysis agitans may complicate Graves's disease, and in the case of the former two affections, especially of epilepsy, the connection seems particularly close, so close that epileptic attacks are thought by some observers to belong to the specific symptomatology.

[A patient with Graves's disease under my own care, a lady of 30, has had serious attacks for many years, some of which have seemed positively epileptic, others at least in great part hysterical. The diagnosis of hysteria has seemed strengthened by the fact that the seizures usually come on when she hears music, so that she has given up the piano altogether, although previously devoted to it, and shuns hearing others play. JAMES J. PUTNAM.]

Hysteria and its hallucinations form the material out of which ideas of persecution are created in exophthalmic goitre. Ballet (*Jour. of Nervous and Mental Dis.*, July, '90).

It would be premature to assume that the toxic agent at work directly excites the convulsions. This is possible, but it is more probable that the epilepsy is associated with Graves's disease just as it may be associated with migraine or with tabes. A tissue-poison of some sort, not necessarily that which is found in the thyroid, may act as the exciting cause.

Local cramps and muscular spasms are of occasional occurrence. It is not known whether they are of central or of peripheral origin.

Tremor is almost, though not abso-

lutely, universally present. It is fine and rapid, and usually involves the hands alone, though sometimes also the head and other parts.

The tremor of Graves's disease is most marked in the hands, and may be confined to them. Other muscles most often affected are the pectorals, serratus magnus, and erector spinæ. If the tremor is well marked in any group of muscles, it is sure to be general over the whole body to some degree. Placing the hands on the patient's shoulders when he is standing will detect even very slight tremor. Maude (Brain, Autumn, Winter, '92).

Choreiform twitchings are also common, suggesting the fine, jerky movements of many young girls of nervous temperament.

The voice in Graves's disease is occasionally stridulous, weak, high pitched, and tremulous, but one should not too hastily refer this to localized lesions causing paresis of the vocal cords. This, too, may occur, but the peculiar change of voice is, perhaps, a phenomenon of more subtle character.

Localized paralyses and atrophies belong to the rarer signs. The paralyses are analogous in general characters to those met with in tabes. In both cases there may be either transitory or relatively permanent loss of power in the muscles supplied by cranial nerves, especially the eye-muscles, and those of the face and the larynx; while the sudden, functional paraplegias of tabes are, perhaps, analogous to the "giving way of the legs" in Graves's disease.

The following symptoms may occur besides the classical trio: Elevation of temperature of one or two degrees (the urine presenting no febrile character); muscular trembling constant, uniform, uninfluenced by voluntary movements (the myograph shows eight or nine oscillations a second, the most rapid type of trembling known); sensation of warmth; giving way of the legs (mild

paraplegia) without spasmodic phenomena or lancinating pains. Charcot (Le Bull. Méd., Feb. 3, '89).

The paraplegia at times associated with Graves's disease is due to a lumbar myelitis, and trembling to a mild inflammatory process extending to the cervical and dorsal cord. These are the result of a toxic substance in the blood from disturbance of the thyroid function. The influence of a neuropathic constitution is not excluded by this assumption. Angiolella (Boletino de Med. Naval, Madrid, Fasc. 1, '93).

One might expect that the muscles which are most prone to show weakness would be the ones most likely to become paralyzed, but this is apparently not borne out by experience. The movement of the eyes which is most often defective in Graves's disease is convergence, but paralysis may affect the external recti as well as the internal. The explanation for this discrepancy lies partly in the fact that the disorders of movement such as underlie the impairment of convergence and change of voice, which sometimes show themselves as impairing the consensual lateral movements of the two eyes, are due, partly at least, not to localized lesions, but to central disorders of co-ordination (Sattler).

Hemiplegia may occur in a curable form, not due to hæmorrhage and perhaps analogous to hysterical hemiplegia.

Muscular atrophy, of the spinal type, rarely reaching a high degree, affecting pre-eminently the intrinsic hand-muscles, with quantitative electrical changes, and susceptible of cure, may occur. Only one typical case of this sort has come within my personal observation. This case was in all respects severe, but ended in almost complete recovery. This patient found great difficulty in rising from a chair and mounting the stairs, and the gait was a high degree of waddling character.

I have, however, seen several patients who exhibited great difficulty in rising from the chair or mounting stairs, and perhaps careful search would have revealed diffuse or localized atrophy as a cause.

Cardiac signs: tachycardia, not easily controlled by digitalis, excitability, often irregularity, and palpitation are the common signs. Secondary dilatation is frequent, and with it loud systolic murmurs. True endocarditis is not characteristic, and even conditions which seem serious may disappear if the progress of the case is otherwise favorable. The pulse-rate frequently reaches 150, occasionally 200 or more, especially during attacks of palpitation. These attacks can occur without apparent cause often at night, and be of alarming severity and cause terrible distress, though in fact death rarely occurs in them. Möbius suggests that the apparently-causeless occurrence of these seizures marks them as probably of toxic origin; but if this is sound reasoning it must be extended to embrace many cases of tachycardia in neurasthenia and hysteria.

Vasomotor system. Flushing and high vascularity of the skin, "dermatography," and pulsation of the larger arteries, especially the carotids are very common. Less often noted, but calling for further study, are pulsation of the abdominal organs and vascular dilatation confined to localized areas.

Attention called to the distended condition of the arteries of the body generally in this disease, especially the aortic branches; similar conditions found in the arteries of the extremities as in the palmar arches and crurals. Capillary pulsation noted and pulsation of the spleen, liver, and even of the kidneys. Gerhardt (Centralb. f. Chir., Sept. 5, '96).

A fatal case of exophthalmic goitre in a girl 11 years old. She was large and well formed, but infantile. Menstrua-

tion had not yet appeared. Exophthalmos was marked. The thyroid gland was slightly, but perceptibly, enlarged. There was no thrill, but a systolic bruit was heard on auscultation over the goitre. The heart was rapid, 132 in the minute. There were general tremors. The treatment consisted of rest in bed, and tincture of belladonna, 3 minims; potassium bromide, 10 grains, thrice daily. Nausea and vomiting set in, a *little blood and some coffee-ground material being evacuated on several occasions*. The condition of the patient grew gradually worse, and death resulted from exhaustion. An autopsy could not be secured. Armstrong (Liverpool Medical-Chir. Jour., Feb., 1900).

Three cases of exophthalmic goitre in which hæmorrhages from practically all the mucous membranes occurred. In the one the bleeding from the membranes associated with huge extravasations of blood into the skin. She gradually improved, and the hæmorrhages finally ceased. In a second case, also a woman, during a thirty-five days' residence in the hospital she had six severe attacks, and was discharged unimproved. Popoff (Neurol. Centralb., Apr. 15, 1900).

Study of the condition of the blood-pressure in exophthalmic goiter, using the Basch, Hawksley, and Gärtner instruments. With the Basch instrument the pressure was usually normal or somewhat increased; rarely decreased. With the Hawksley instrument the subject showed about an equal division into subnormal and excessive pressure. With the Gärtner instrument 2 showed a decrease, 7 showed normal conditions, and 6 exhibited high pressure. The results were much the same, therefore, with all 3 instruments; and the general conclusion reached is that the blood-pressure in this disease may be normal, decreased or increased, but is usually normal or increased. J. Donath (Zeitsch. f. klin. Med., Bd. xlviii, ht. 1 u. 2, 1903).

The radial pulse may feel weak and thready when the carotids are beating strongly. The dilatations are due to influences acting on the affected portions of the blood-vessels, and not to general

increase of blood-pressure, which does not, in fact, occur. Arterial pulsation may be seen in the fundus of the eye, but this sign, as well as tortuosity of the veins near the disk, is often looked for in vain. Local gangrene has occasionally been noted.

Œdemas occur, sometimes due to localized circulatory changes, sometimes to cardiac weakness, sometimes, perhaps, to a myxœdematous tendency, and sometimes to unknown causes. The eyelids, one or both, are prone to this œdema, and may remain affected very obstinately.

Albuminuria, which is usually transitory, may occur and should be watched for. General œdema, not due to cardiac weakness, may be a striking feature of early stages of the disease (Mackenzie). A non-pitting œdema of the legs or of the abdominal walls may occur, suggesting myxœdematous œdema, but not influenced by thyroid treatment.

Slight œdema limited to the legs is not an infrequent accompaniment of exophthalmic goitre. This results from cardiac weakness, and is best met by the administration of cardiac tonics; a general œdema may be one of the main features of the early stage of the disease, and is not necessarily an unfavorable sign; general œdema may supervene before death. Swelling of the eyelids may be an early symptom, or it may come on after some years. Sometimes a non-pitting swelling is met with, affecting the lower extremities and resembling the swelling of myxœdema. This kind of swelling is, however, unaffected by thyroid treatment. H. Mackenzie (Edinburgh Med. Jour., 401-410, Apr., '97).

There are but four varieties of œdema of the limbs in thyreo-exophthalmic neurosis: Œdema of cardiac origin, dyscratic œdema, œdema coincident with albuminuria (this being independent of the well-known parenchymatous or glomerular lesions of the kidneys), and œdema of vasomotor origin. Œdema of

cardiac origin may be paroxysmal. In well-established cases of œdema of the legs by asystole, when the impulse of the overtaxed heart is suddenly weakened and the tension of the radial pulse is suddenly lowered, digitalis excels; it is still more excellent when the œdema follows definite organic alterations of the muscle, of the cardiac valves, and of the aorta; apart from that, it should be banished from the treatment of exophthalmic goitre.

By dyscratic œdema of the limbs in exophthalmic goitre is meant that which is coincident in many cases of the disease with chlorosis, or with anæmia engendered by chronic metritis, with leucorrhœa, amenorrhœa, or dysmenorrhœa, or following pregnancy, nursing, or puerperal hæmorrhages; in the two sexes, following sexual abuse, diarrhœa, or protracted illness, or privations. In the form of exophthalmic goitre due to these causes, in which the pulse does not usually exceed 100 or 110, and the pulsatile goitre and the protrusion of the eyes are but moderately developed, in which the neurosis occurs with symptoms of torpor, soft œdema of the feet and of the lower part of the legs is common after walking and riding, or it becomes established for several weeks in the legs without the presence of albumin in the urine or dilatation of the heart. Infusions of pure bitters, milk, rare meats, and raw meat should be recommended at first; if this is not sufficient, arsenic should be resorted to. Œdema of the limbs is not observed whenever chemical analysis reveals the presence of albumin in the urine in exophthalmic goitre. It never exists when albumin, not very abundant, however, is not observed except during the digestive period. Liégeois (*Jour. des Praticiens*, Aug. 7, '97).

Maude has described fugitive puffy swellings as occurring in various parts, as the face, neck, arms, etc.

Irregular and inadequate innervation of the circulatory system undoubtedly accentuates or causes other disturbances, such as the diarrhœa, the sweating, the exophthalmos, the epistaxis, and other

hæmorrhages from the mucous membranes. It must not, however, be forgotten that if it be true that a poison is circulating with the blood, the irritation attending its elimination might help to account for some of the affections of the various secreting surfaces: the skin, the bowels, and the kidneys, as well as of the organs concerned in primary metabolism. Still more must it be remembered that the real explanation of many of the constantly recurring—so to speak—specific signs of this disease is probably far more subtle than our conceptions can now fathom.

Not only are dyspnoea and a sense of suffocation present during attacks of palpitation, but a diminished inspiratory capacity is sometimes to be noted, as an early symptom and throughout the illness.

Forty cases of exophthalmic goitre examined. There was an average diminution of chest-expansion, but this was dependent upon, and in the individual cases more or less proportionate to, the amount of general muscular weakness. Patrick (*N. Y. Med. Jour.*, Feb. 9, '95).

The writer distinguishes between the primary disturbances and those induced secondarily by mechanical compression of the trachea by the struma—cardial and bronchial asthma or hysteria. The primary are characterized by the shallowness of the respiratory curve, protracted inspiration and expiration, irregularity in the shape and size of the curves, with intervals of pauses in the respiration more or less complete. There is another form of the primary disturbances characterized by paroxysmal, rapid, deep breathing, likewise with pauses. He attributes both to the functional disturbance of the thyroid gland, which is responsible for the disease, and is inclined to endorse the possibility of combating this morbid secretion of the thyroid with the milk or serum of thyroidectomized animals. L. Hofbauer (*Jour. Amer. Med. Assoc.*, from Mit-

teilungen a. d. Grenzgebiete d. Med. u. Chir., Vol. xi, No. 4, 1903).

The typical paralyses of the eye-muscles have already been referred to as among the affections of the nervous system.

Besides these, the most characteristic signs are retraction of the lids (Stellwag's sign), exophthalmos, and the impairment of the power of convergence. Graefe's sign (lagging of the upper lid when the globe moves downward) and impairment of the wink-reflex are directly traceable to the retraction of the upper lid.

Exophthalmos is late to appear and marks the height of the disease. Von Graefe's sign commonly appears before the exophthalmos. J. M. Taylor (*Med. and Surg. Reporter*, Apr. 14, '88).

Graefe's lid-symptom found in 12 out of 613 patients of all kinds. People in health can, not infrequently, cause it by staring. As it often fails in exophthalmic goitre, its diagnostic importance is not great. Sharkey (*Brit. Med. Jour.*, Oct. 25, '90).

The two chief abnormal variations in movements of the eyelids are von Graefe's sign—the eyelid descending not synchronously with the descending globe, but more slowly and, it may be, more jerkily—and Stellwag's sign, consisting in retraction of lids and consequent increase in the width of the palpebral fissure. This retraction is most obvious in the upper lids, and is frequently associated, as is seen when the patient's gaze is directed downward, with a cupping of the lower lid. Both these signs are quite independent of exophthalmos, and their clinical value is difficult to estimate. They are neither constant nor pathognomonic, and are variable even in the same person. Von Graefe ascribed the deranged movement to spasm of the fibres of Müller. More recently Ferri has advanced the theory that the retraction of the lid is the result of the mechanical shortening of the levator palpebræ due to the increased volume of blood-vessels distributed in its sub-

stance. The writer leans to the theory that these states are due to an affection of the oculomotor nucleus and a consequent paresis of the upper facial group of muscles. A. Maude (*Edinburgh Med. Jour.*, July, '97).

Case of exophthalmic goitre observed with typical heart and thyroid symptoms, but with only unilateral exophthalmos. This was the third case the author had seen. Hinshelwood (*Edinburgh Med. Jour.*, May, '98).

Retraction of the lid may be present without exophthalmos, the staring appearance giving a false impression of protrusion. The lid-signs may vary in intensity from day to day. The protrusion itself is generally present in greater or less degree, sometimes, though very rarely, to such an extent that the eye is nearly or quite dislocated from the socket, yet the movements of the globes remain consensual and double vision is not characteristic.

In about 20 cases of exophthalmic goitre a limitation of the field of vision observed, which fluctuates with the variations other symptoms show. Kast and Wilbrand (*Neurol. Centralb.*, July 15, '90).

Limitation of the field of vision does not belong to the clinical picture of exophthalmic goitre, and its presence, in the absence of material lesions of the brain, fundus or media of the eye, should suggest the co-existence of hysteria. Soucques (*La Semaine Méd.*, May 20, '91).

The protrusion may come on rapidly and may subside as rapidly, showing that it is due to congestion, perhaps associated with muscular relaxation. Later, it becomes fixed and is referable in part to accumulation of fat in the orbit. It is often greater on one side than the other, the right lobe being usually the more prominent. The right lobe of the thyroid, as has already been noted, is likewise usually more prominent than the left, and the conclusion almost forces itself on the mind that the two phe-

nomena are in some way related. It occasionally happens, however, that the larger lobe of the thyroid and the more protruding eye are on opposite sides. The failure of the lids to cover the eyeball prepares the way for ulcerations of the cornea, though it seems probable that the other influences come in, since the exposure alone is not always a sufficient explanation.

Sensory disorders are not characteristic except those which are related to the general feelings of malaise. Many others occur in individual cases, but they are largely signs of concomitant neuroses.

Patients with acute Graves's disease usually grow thin and weak, while excess of phosphates and urea appear in the urine. On the other hand, in mild or even in rather serious cases the weight may remain unchanged or may even increase.

It is worthy of note in this connection that obesity, in otherwise-healthy persons, is not always overcome by thyroid preparations, and that different persons react very differently as regards loss of weight. Toward the close of life in fatal cases, and even at an earlier period, a sort of cachexia may come on which obstinately resists treatment.

Alimentary glycosuria, characterized by the appearance of sugar in the urine within a few hours after taking grape-sugar or glucose (the usual test-dose being 100 grammes) is relatively common among patients with Graves's disease, though this peculiarity is shared by the subjects of various other neuroses.

True diabetes mellitus is also thought to be relatively common among them, though, in fact, rare.

Feverishness (increased internal temperature) may be present during acute stages, but by no means in proportion to the sense of heat.

Icterus, salivation, and digestive disorders occur, though rarely, except for the *diarrhœa*, which will be referred to separately.

Diseases of the gastro-intestinal tract, *diarrhœa*, and vomiting belong to the symptomatology of Graves's disease, the former being especially common. The *diarrhœa* is usually not due to fermentative changes, but to anomalies of secretion and peristaltic action, either based upon disorders of innervation or indicating the elimination by the intestine of some toxic substance. Sometimes the stools are simply liquid, sometimes they are peculiar in character. Cholesterin has been found in considerable quantity, and in the case of a patient of mine a number of whitish masses were excreted, the character of which was not ascertained. Sometimes the stools are bloody, and in this and other respects one is reminded of the other forms of hysterical or "nervous" *diarrhœa*, which are so common. The hypersecretion is not much affected by opium.

Vomiting may occur in attacks suggesting those of tabes, but usually without pain.

Signs of impaired local nutrition may be present in the form of swellings of the joints, as of the fingers, ulcerations of the cornea,—due partly, but not wholly, to exposure arising from the wide lid-openings,—and various affections of the skin and its appendages,—as vitiligo, pigmentation, falling of the hair, inflammation about the nails, scleroderma, sweating, erythema, urticaria, and leucoderma.

About 111 cases of exophthalmic goiter have been reported in which skin-lesions of a more or less serious type have co-existed. This list included 49 cases of hyperidrosis; 15 cases of pigmentary changes; 15 cases of myxœdema; 14 cases of simple œdema; 5 cases of scleroderma, most of them generalized, a

small proportion representing the circumscribed form; alopecia, often generalized and vitiligo; lastly, one or two instances of telangiectases, purpura, urticaria, erythema, and 1 of hydrocystoma. The last case—namely, that of exophthalmic goiter with hydrocystoma—was contributed by the writers, and as far as they are aware is the first case of the sort to have been reported, though hyperidrosis has been frequently observed. They also report cases associated with telangiectases, cutaneous pruritus, and cutaneous pruritus and angioneurotic œdema. Nevins Hyde and E. L. McEwen (*Amer. Jour. Med. Sci.*, June, 1903).

The fingers may become tapering and very movable in their articulations. It is possible that changes of this character, and others met with in Graves's disease, indicate changes in morphological tendencies of growth such as occur in myxœdema and after castration.

The spleen and lymph-glands may become enlarged to the point of lymphadenoma (Gowers). The thymus is often persistent.

The uterus and the breasts—one or both—may atrophy prematurely, or, on the other hand, the breasts may enlarge. Basedow reported a case of this sort in a man.

The bones may become soft and it is said (Revilliod) that symptoms like those of Graves's disease may occur in osteomalacia.

Myxœdematous changes occur as a sequel to the thyroid atrophy which may follow the Graves-disease degeneration of the thyroid gland. Whether myxœdema and Graves's disease may truly be said to coincide is an open question, though various cases have been reported which indicate that this is possible. Confirmatory evidence should be carefully noted and critically studied. The sorts of myxœdematous changes most likely to occur are non-pitting œdema,

supraclavicular swellings, scleroderma, falling of the hair, mental dullness, atrophy of the breasts, disease of the bones and joints, dryness of the skin.

Diagnosis.—There is no difficulty in the diagnosis of a typical case of Graves's disease. On the other hand, in the early stages of very mild cases one may be able to do no more than suspect the presence of the trouble; yet this suspicion may be of great practical importance. There is, perhaps, no single symptom which may not be absent or so inconspicuous as not to challenge attention. Even the rapid pulse may, perhaps, be lacking. This is extremely rare, but pulse-rates of about ninety are not very uncommon. Persistent tachycardia of any grade, persistent nervousness, agitation, and tremor, not associated with typical signs of neurasthenia or hysteria, or out of proportion to those signs, persistent—even if slight—suffusion of the face, and causeless diarrhoea should always awaken suspicion, and if the patient has had an indolent goitre for some years or has been recently exposed to severe emotional excitement or any of the other exciting causes of Graves's disease, there will be all the more reason for thinking that the suspicion is well grounded. High temperature, sweating, and loss of flesh, would all be confirmatory indications, but the presence of well-marked signs of hysteria or neurasthenia might, in the absence of an enlargement of the thyroid, offer another and sufficient explanation. The diagnosis of what might be called the *stage of predisposition*—in which, of course, no positive symptom would be manifest, or only occasionally manifest—is perhaps impossible at the present day. Nevertheless, by the aid of careful observation some degree of success may at some future time be attempted.

In Graves's disease the body-resistance to the passage of the electrical current is lowered in a remarkable manner: a point to which Charcot was first to draw attention. This peculiarity ascribed to the diminished resistance of the vasomotor dilatation of the skin-capillaries, which thus render the skin saturated with fluid, and practically reduce the thickness of the ill-conducting epidermis to a minimum. R. Norris Wolfenden (Med. Abstract, Jan., '88).

Low electrical resistance is frequently found in Graves's disease. In doubtful cases it is a valuable positive sign, but its absence in such cases has no weight. A. Eulenberg (Berliner klin. Woch., Jan. 14, '89).

Diminished electrical resistance found in 15 out of 20 cases of exophthalmic goitre. But this sign is worthless for diagnosis, as the electrical resistance varies with the moisture of the skin. The resistance greatly lessens when the skin perspires. Volkel ("Ueber einseitigen Exophthalmus bei Morbus Basedowii," '90).

Diagnosis of Graves's disease may be made when delirium cordis and tremor are present, but not without these, all other symptoms being secondary and comparatively unimportant. Lemke (Deut. med. Woch., Dec. 20, '94).

Under PATHOLOGY I will indicate the grounds for thinking that the thyroid secretion may play a certain part in the quasiphysiological phenomena which fall within the bounds of ordinary health, and if this is true much light may be expected from the further analysis of these states.

Etiology.—Graves's disease is found among men and among women, and even among animals; and may occur in childhood,—even infancy,—in adolescence, in adult life, and rarely in old age. It is, however, far more common among women than among men, and almost always shows itself first during early adult life.

Graves's disease is very rare in children, twenty-four cases only having been

reported. Most of these reported cases occurred in girls, the average age varying from 8 to 13. One case was recorded at the age of $2\frac{1}{2}$ years. In many the exciting cause was unknown; in some the cause seemed to have been a sudden shock. The writer adds two more cases of Graves's disease occurring in children.

Tremor and Graefe's symptom are generally absent in children, but chorea often forms a complication. The prognosis in children is not unfavorable, some recovering completely, and others only having slight exophthalmos subsequently. Dreschfeld (*Practitioner*, Aug., '96).

Exophthalmic goitre occurs approximately 4.5 times as often in females as in males; the disease is most common during the period of active adult life, occurring earlier in females than in males; the disease is uncommon, if not rare, in the black race. A. A. Eshner (*Inter. Med. Mag.*, Apr., '98).

Forty-two cases of exophthalmic goitre collected in children below the age of fifteen, the youngest being a child four and one-half years old. These figures show that the condition is uncommon in childhood, especially in the earlier years. Symptomatology does not differ much from that of the ordinary form, and the three cardinal symptoms of tachycardia, goitre, and exophthalmos exist, though the last is sometimes less marked than in adults, and may be unilateral. Tremor is also uncommon in the child, but, on the contrary, chorea is very frequent. There is great irritability of character. The disease is apt to come on more rapidly in a child, sometimes appearing suddenly or becoming apparent in the course of a few days, the cardiac phenomena being the first to attract attention. In some cases goitre is present for a considerable time before the appearance of the other symptoms. The writer records some instances in which tremor was the first symptom to appear, and fatigue and headache usually set in early. The duration of the disease is not so long as in the adult. Barret (*Jour. de Méd. et de Chir. Prat.*, July 10, 1902).

No race is wholly exempt, nor the in-

habitants of any special country, and none are very much more prone to the disease than the others. Every now and then the claim is made that it is especially common in one or another place or section of country, but this is not borne out by prolonged investigation and is probably an example of the accidental coincidences in which the history of medicine abounds. On the other hand, there is rather more reason to think that Graves's disease is more common in districts where simple goitre is endemic. If this prove true the fact would harmonize with the observation that the special kind of goitrous affection met with in Graves's disease is more likely to occur on a basis of thyroid disease of other sorts than on a basis of health. On the other hand, this relative frequency of Graves's disease in goitrous districts is not so great as would probably be the case if simple goitre acted by mechanical irritation.

Development of the disease requires two factors: first, a functional anomaly of the thyroid gland, and, second, a neuropathic condition, either hereditary or developed through fright or trouble. Müller (*University Medical Magazine*, Sept., '93).

Group of cases showing the complexity of relationship between ordinary goitre and Graves's disease, and likewise as an example of family tendency. A mother and three daughters were afflicted as follows: The mother had goitre, with difficulty of breathing; the oldest daughter had goitre without nervous symptoms; the next daughter had complete Graves's disease, following strong emotion and beginning with an attack of cardiac deficiency; the third daughter had a mild form of typical Graves's disease without apparent cause. Soltas (*France Méd.*, Aug. 14, '96).

Neurotic heredity and emotional excitement considered the most important of the predisposing causes. Valençon (*Gaz. des Hôp.*, June 19, '97).

There can be no doubt but that Graves's disease is more common in neuropathic families and among neuropathic persons than in connection with sound health, and it is equally certain that it often develops rapidly after exposure to fright, prolonged anxiety or excitement, profound grief, or after physiological strains such as draw strongly on the resources of the nervous system.

Neurosis is the only satisfactory conception of the disease. Lefaive (Gaz. des Hôp., Jan. 12, '89).

Fright seems to be an etiological factor. The disease is a widely-distributed derangement of the emotional nervous system, but alteration in function of the thyroid has much to do with many of the secondary symptoms. H. W. G. Mackenzie (Lancet, Sept. 20, '90).

Exophthalmic goitre considered a branch of the neuropathic and closely related to the arthritic family. Charcot (Schmidt's Jahrbücher, Feb., '91).

The approximate cause of Graves's disease is probably abnormal action of the thyroid gland. The conditions favoring the development are: female sex, neuropathic state, climatic conditions, all causes diminishing the resistance of the organism, and especially mental shock. Möbius (Med. Chronicle, July, '92).

Exophthalmic goitre considered a general neurosis, having at times spinal, bulbar, and cerebral symptoms. It can precede, follow, alternate with, or accompany other manifestations of mental degeneration. The psychical troubles of exophthalmic goitre do not form an integral part of the affection. Their association with this affection is the result of the hereditary condition from which they both arise. Exophthalmic goitre is a pons-medullary neurosis, consisting in the exaggeration and permanence of the physiological phenomena of emotion. Raymond and Sérieux (La Semaine Méd., Aug. 10, '92).

Only an organic lesion of the central nervous system can explain all symptoms. P. Mannheim (Schmidt's Jahrbücher, Feb. 15, '94).

Strong emotional disturbances are the most common causes of this disease. These affect the brain in such a way that vascular disturbances result. Sooner or later substances are set free in the blood, perhaps largely from the enlarged and overnourished thyroid, and these cause a principal part of the other symptoms, as, for example, the nervous ones. So it is easy to understand how removal of the gland frequently causes improvement, evidently without removing the disease, nor is it likely that organic changes can be found in the brain in a disease of this kind. C. Gerhardt (Mittheilungen aus den Grenzgebieten der Med. u. Chir., B. 1, H. 2).

The majority of the symptoms are traceable to some lesion of the sympathetic nervous system. Some are the result of irritation along the sympathetic, while others are due to paralysis of the sympathetic. William C. Krauss (Buffalo Med. Jour., May, '96).

Case of a woman, aged 33 years, who, through a fall in a stairway, was badly frightened. Symptoms of exophthalmic goitre immediately followed. Within two months, however, the palpitation lessened, and myxoedematous swelling of the face and of the lower extremities occurred. The goitre became fibrous, the uterus passed into a stage of atrophy, and the skin was dry. J. A. Kirschi (Wiener klin. Woch., July 5, 1900).

Two cases of exophthalmic goitre which appeared suddenly in soldiers after being in battle. In the one case, aged 30 years, the mother of the patient had been operated on for goitre. W. H. Harland (Brit. Med. Jour., Sept. 1, 1900).

There is probably a fright-centre as well as a speech-centre, and this may be congenitally weakened. A physical manifestation in the thyroid in a predisposed person may assume a permanent character from an inherent predisposition. F. W. Higgins (Jour. Amer. Med. Assoc., Sept. 8, 1900).

Among the causes of this order are influences associated with *pregnancy and childbirth*. It has, to be sure, been thought that another explanation was nearer,—namely, that based on some

special relationship between the functions of the thyroid and those of the generative organs,—but as somewhat against this is the fact that there is no close correlation between the special phases of the uterine disturbance and the thyroid disease. Both pregnancy and childbirth may excite or aggravate or, on the other hand, lessen the symptoms of exophthalmic goitre.

Attention called to the very intimate relation which exists between the menopause and pathological conditions of the uterus and Basedow's disease. In this relationship exophthalmic goitre placed in the position of an effect or consequence, and not the cause, of the uterine condition. An improvement in the local condition is always followed by the appearance of the general disease. Jouin (*Nouv. Arch. d'Obstét. et de Gynéc.*, No. 6, '95).

How do emotional excitements and quasiphysiological strains and neuropathic tendencies act in inducing Graves's disease? Are they to be classed as exciting or as predisposing causes; or is there no real difference, here, between excitation and predisposition in this connection? The extreme advocates of the thyroid (toxic) theory assume that in all cases of relatively-sudden outbreak a certain degree of this special form of thyroid disease or at least of impaired power of resistance to disease was already present, and that the causes mentioned act by increasing the instability of equilibrium of the nervous system and so making it react in such a way to the thyroidal poison as to increase in its turn the thyroid disease. The thyroid disease could not, it is thought, be caused by a nervous influence, such as fright, even combined with that of neuropathic predisposition. But the truth is that in exercising our ingenuity over explanations of this sort, which involve assumptions that may or may not be true, we are

apt to forget that the conditions may really be far more subtle than we conceive them. For the present the important thing to remember is the broad fact that nervous perturbations do at times bring on the signs of the disease in a remarkably-rapid manner, and that so far as one can tell it is not necessary in such cases that antecedent thyroidal disease should have been present. We are as ignorant of the real mode of action of the emotional cause as we are in the case of chorea or of paralysis agitans. We cannot deny that some special predisposition may exist in a latent form in all these cases, and should admit that the discovery of its presence would simplify the problem; since otherwise it is not easy to see why an influence so common as that of emotional excitement should produce in different cases such diverse effects. I would only, in addition, foreshadow a theory which will be explained below at greater length: namely, that there is not only a relation of cause and effect between a special form of thyroid disease and the other signs and symptoms of exophthalmic goitre, but also a close correlation between the thyroid functions and certain special nervous functions in health. If this is so it is easier to understand how certain particular kinds of irritation should more frequently act as causes for Graves's disease than other irritations apparently of equal severity.

The secretion of the thyroid is exaggerated and probably altered. R. W. Briggs (*Edinburgh Med. Jour.*, Feb., '93).

Graves's disease considered a disease of the thyroid rather than of the nervous system. W. S. Greenfield (*Brit. Med. Jour.*, Dec. 9, '93).

Exophthalmic goitre in its various degrees results from a perversion of the function of the thyroid gland. Horsley (*Brit. Med. Jour.*, Dec. 5, '96).

Graves's disease results from some form of specific muscle-poisoning produced by the thyroid gland. Lemke (*Münch. med. Woch.*, No. 15, '96).

The thyroid body produces a normal and an abnormal iodothylin that are, possibly, identical as to chemical analysis and to experimental medicine, but that are different in their biological reactions. The one, physiological, acts as a regulator of the nutritive changes; the other, abnormal, acts as a disturber of these changes, and is capable of setting up the cachexia of exophthalmic goitre. This theory explains the change of an ordinary goitre into an exophthalmic goitre. Gauthier (*Revue de Méd.*, Mar. 10, 1900).

Series of cases of acute thyroidism following the therapeutic use of iodine. In another series there had been mild symptoms of Basedow's disease, which were enormously aggravated by the use of iodine. Belief that iodine acts by causing an absorption from the gland of certain toxic substances contained in it. The toxic symptoms develop in only a small proportion of cases, owing to individual idiosyncrasies. Robert Breuer (*Wiener klin. Woch.*, July 19, 1900).

Chlorosis has been frequently assigned as a cause of Graves's disease, and indeed the two affections are often enough seen in conjunction. But the fact that so careful a student of chlorosis as Van Noorden asserts that he has not been able to detect any such relationship shows that it cannot be a very important one. On the other hand, the impossibility, at present, of assigning the true cause for every outbreak of Graves's disease is well illustrated by the history of an acute case, which ran its whole course while the patient was under observation in Van Noorden's clinic, and apparently free from unfavorable influences.

Infectious diseases sometimes lead to thyroiditis, and thus to Graves's disease.

Uterine fibroids, disease of the nasal tract, and disease of the intestinal tract—the latter serving perhaps as a source

of ptomaine poisoning—are occasionally partial causes which should be remembered during efforts at treatment.

Partial atony of the large intestine is a frequent and important complication, perhaps even a cause, of exophthalmic goitre. Federn (*Wiener Klinik*, Mar., Apr., '91).

Two cases in which attention to the toilette and antiseptics of the bowels proved extremely beneficial: a feature sustaining the relation between Graves's disease and intestinal toxæmia. Minor (*Med. Record*, Dec. 2, '99).

Graves's disease is an autointoxication from the alimentary canal, due to a peculiar inability properly to digest nitrogenous food. Such poisons in the blood may overstimulate the thyroid gland, and may occasionally lead to atrophy of the gland and to myxœdema. Thomson (*Med. Record*, Jan. 13, 1900).

Pathology.—The account of the pathological anatomy must be, for the present, confined to the description of the appearances observed in the different organs, and, as most of these are secondary, they can be dismissed briefly. Of great importance, however, are the changes noticed in the thyroid gland, and for these the results reached by Hämig may be accepted as expressing the best modern views. In common with the majority of observers, Hämig found a diffuse parenchymatous hyperplasia of special form. This hyperplasia may lead to the formation of nodules, and it may be attended by an alteration of the secretion such that thin albuminous secretion is formed instead of the colloid. The cylindrical cells of the gland may undergo vacuolization, which is to be taken as a result of activity of secretion.

Other forms of goitre occur in Graves's disease, but they arise from other causes, such, for example, as those which lead to the endemic variety, and the changes found in them are not characteristic of the exophthalmic form of goitre.

There are slight histological differences in different cases, such that sometimes the arrangement of the cells is diffuse, while in other cases small, ill-defined follicles are formed, and in others the tissue takes on an embryonic character. Again, the epithelium may be of slender form and the arrangement glandular.

Goitre examined in 10 cases of Graves's disease. Of these 8 were diffuse and 2 nodular. The diffuse were divisible into three groups. In the first the alveoli were large and filled with colloid material, and were distinguished from those of normal thyroids only by the presence of colloid in the lymph- and blood- vessels and between the fibres of the stroma. In the second group the follicles were smaller, and usually only partly filled with colloid, which was not so shining as in the first group. The septa contained less colloid in the connective tissue and lymphatics, but just as much in the veins. The epithelium showed a tendency to form papillæ. The thyroids of the third group contained many solid cell-masses, of which some were follicles filled with desquamated epithelium, others lobules and groups of lobules made up of narrow cell-strands. In the nodular goitre some lobules attained a diameter of $\frac{1}{2}$ to 3 centimetres; others were compressed to a diameter of $\frac{1}{10}$ millimetre. Many nodules were made up of solid cell-strands containing in numerous places balls of colloid matter. Other nodules consisted of small, solid cell-masses; still others resembled the ordinary colloid goitre. The first group of diffuse hyperplastic goitres showed hypersecretion; the second, an increase of function associated with an alteration in the secreted matter, allowing more ready absorption; while in the third group the increased activity of the gland manifested itself partly in hypersecretion, partly in the formation of solid cell-masses. Ferner (*Virch. Arch.*, Mar., '96).

Examination of muscular system in 4 cases; a wide-spread degeneration caus-

ing a replacement of the fibres by fatty tissue found in all. This accounts for the tremor, the exophthalmos (from weakness of the orbital muscles), incoordination of the eyeball, and general muscular weakness. The heart-muscle does not appear to be included in the process, although excess of connective tissue due to a proliferation subsequent to degenerative process was found. The nervous system affected showed no organic change. In the thyroid there was proliferation of the epithelium of the follicles, absence of the colloid material, and failure of differentiation of the cell-masses. Askanazy (*Deutsches Archiv f. klin. Med.*, B. 61, p. 118, '98).

The lymph-glands throughout the body may be enlarged and the thymus persistent. A great number of special lesions have been found in one or another segment of the nervous system, especially the medulla oblongata, but they are, in all probability, secondary and indicative of the excitation going on there.

The heart may be found dilated and its muscles degenerated; and so, also, degenerations in the arteries and in the internal organs have been found; and in the spinal cord.

The time has gone by when any considerable number of supporters can be found for the theory that this disease is due to the localized lesions occasionally found in the medulla oblongata or the sympathetic system.

Emphasis laid upon the presence of a permanent stimulation of that portion of the cervical sympathetic which presides over the dilatation of vessels in the orbit, in the thyroid body, and over the heart. The thyroid enlargement considered to be secondary effect of this distension; to be a symptom of the disease, and not the cause. That superabundance of thyroid secretion thus induced may be injurious is, however, admitted.

The lesion is nuclear, the nuclei of nerves influencing the heart and blood-vessels, as indicated, being discrete in the bulb and upper portion of the cord (while those influencing the limb and trunk-vessels are lower down and therefore escape), and are there affected singly or in groups. Abadie (*Arch. d'Ophth.*, Nov., '96).

The pathological lesions thought by some to be due to the introduction into the system of a poison from without; this may possibly be a protozoön. This is supported by wide circle of diffusion which suggest its being a general disease, such as urticaria; mania; epistaxis; œdema of the conjunctiva; fleeting œdemas; general anasarca; pulmonary, intestinal, meningeal, and cerebral hæmorrhages; vomiting, with intense prostration; and intermittent albuminuria. It is possible for a simple endemic goitre to drift into the exophthalmic form. Carter (*Edinburgh Med. Jour.*, Oct., '99).

The key to the real mystery of the disease must be sought elsewhere, and it is generally agreed that the only plausible explanations of the great array of symptoms which are liable to present themselves are, on the one hand, that suggested by the name "neurosis," and, on the other hand, that which assumes a toxic action due to altered secretion of the thyroid gland. The "neurotic theory" is certainly a reasonable one. It is true that the term is vague, but the argument brought forward by Möbius, that one could not properly attribute the enlargement of the thyroid to a nervous disorder is certainly untenable. It has been proved experimentally that the most trifling mechanical injuries of the gland are enough to change the character of the secretion and induce parenchymatous hypertrophy, and it is far from unreasonable to suppose that the same result might follow an alteration of the secretion due to nervous influence. In favor of the "neurotic" theory is, of course, the strongly-marked clinical re-

lationship of the disease and its mode of origin. On the other hand, there is also a great deal to say in favor of the view that the altered and increased secretions of the thyroid gland are important factors. The therapeutic and experimental study of thyroidization is in support of this view, and the striking contrast between myxœdema and Graves's disease, as regards the condition of the skin, the nervous system, and the like, even though it does not fully bear critical analysis, is, in general, in favor of this conception.

On the whole, it seems to me perfectly clear, on grounds that cannot be elaborated here at length, that we are still far from grasping the problem in its whole complexity. There is one aspect which has never been sufficiently dwelt upon, and that is the relation of the symptoms of Graves's disease and of myxœdema as well to quasiphysiological states. If in those two conditions we have indications of an excess, on the one hand, and a deficiency, on the other, of the thyroid secretion, then there must be a middle point corresponding to health, and, if alterations of the thyroid secretion in one direction causes abnormal mobility of the nervous system and in the other direction an abnormal sluggishness (leaving out of consideration, for brevity's sake, the question as to the development of uncompensated tissue-poisons), then it is fair to assume that the ordinary mobility of the nervous system is, in a way, dependent on a normal amount and quantity of the thyroid secretion. However this may be, it seems more than probable that we have in Graves's disease a collection of symptoms which are united together not only as manifesting the action of the thyroid poison, but as having a certain quasiphysiological relationship to each other.

Personal case in which death occurred from exophthalmic goitre along with myxœdema. Eleven cases, already reported in medical literature, in which myxœdema and exophthalmic goitre were diagnosed as co-existent. These 11 cases can be placed under four categories:

(1) four in which the exophthalmic-goitrous symptoms were episodes only during the course of myxœdema; (2) two cases of exactly the converse; (3) two instances of the diseases appearing and persisting simultaneously; (4) three others in which, during the course of either of these conditions, symptoms of the disease hitherto absent appeared, but not so fully as to present a complete clinical picture of it. Faure (*Presse Méd.*, Sept. 23, '99).

Series of twenty cases studied with the Riva-Rocci and von Recklinghausen instruments, the measurements being compared with the rapidity of the pulse. The cases were divided into five groups, in direct accordance with the measurements of the blood-pressure. The lowest group and the highest included most of the severe cases. The blood-pressure, however, was not in direct accord, either when very low or very high, with the severity of the disease. The cases of the remaining three groups show moderate blood-pressure (115 to 135, von Recklinghausen); but, as a rule, those with low pressure were severer cases and those with direct pressure were milder. The pulse-rate showed no direct and constant relation to the severity of the disease. The conclusions reached are: That the blood-pressure does not show any constant changes in exophthalmic goitre. It may be reduced or increased; but, in the milder cases, is about normal. The changes which occur in the pressure are due both to alterations in the heart-action and to vasomotor changes. D. Spiethoff (*Centralb. f. innere Med.*, Aug. 23, 1902).

Prognosis.—Some cases of Graves's disease run a rapid course, ending in recovery, and this is especially true of outbreaks occurring in childhood. In a case under the observation of a colleague of

the writer, a girl, 8 years old, had an acute attack due to fright from harsh treatment by her father, but was well at the end of a few weeks. Recovery is also possible in acute cases occurring in adult life and in mild chronic cases, though it is far more common to see some few symptoms persist in spite of substantial recovery from the rest. The exophthalmos often overlasts the other signs.

Some cases have a malignant aspect almost from the outset, and die very rapidly after a few weeks or even days, or from exhaustion and cachexia at the end of a few years. Even cases of great severity may, however, take a favorable turn and substantially recover under favorable conditions; so that no case ought really to be despaired of.

Case of rapidly-fatal exophthalmic goitre observed, the patient dying in three days after pronounced symptoms had appeared. Lloyd (*Polyclinic*, Apr., '88).

Prognosis is comparatively favorable, as far as life is concerned. Nothnagel (*Med. Press and Circular*, Nov. 27, '89).

Prognosis is more unfavorable in men than in women. Kahler (*Inter. klin. Rund.*, Mar. 10, '90).

Gradual subsidence of the cardinal symptoms in Graves's disease noted for long periods. In such cases complete recovery may be claimed. Pribram (*Wiener klin. Rund.*, No. 44, '95).

In 24 cases there was fatal termination in 6; recovery complete or almost complete in 7; improvement in 7; condition much the same in 3. R. T. Williamson (*Brit. Med. Jour.*, Nov. 7, '96).

Treatment.—A great number of methods have been used for Graves's disease and have had their enthusiastic supporters, but it is the conviction of the writer, after a careful trial of them all, that the principal factor in bringing about the favorable result has been not so much that any one of them has struck at the

real root of the disease, but that they have either induced an improvement in some one particular, or have inspired the patient with confidence and encouragement, and through one or both of these ways have given a new "set" to the disordered nerve-functions, which form the chief feature of the malady. In no other way can we explain why it is that one observer has insisted upon the importance of the treatment of the intestinal tract; another on the treatment of the sympathetic system, or the heart; another on that of the nervous system; another on that of thyroid; one on weak, another on strong, electrical currents, etc. If this generalization is correct, it follows that the conscientious physician should have two aims in view: first, to treat his patients with persistence and determined confidence, in order that they may catch his tone of encouragement; next, that each case should be energetically treated at the most assailable point, or points. The treatments proposed may be roughly divided into the "empirical," or "symptomatic," and the "rational," or those based on some theory of the disease. Of the former class the most important are the treatment of the heart, the nervous excitability, the digestive disorders, and the like. To the second class belong the electrical treatment of the sympathetic nerves, the surgical treatment of the thyroid gland, the use of specific remedies like thyroid and thymus extracts (see ANIMAL EXTRACTS: THYROID, THYMUS, and SPLENIC EXTRACTS), the adoption of special diets, used without regard to particular forms of indigestion. Any or all of these treatments may have their value, as above indicated, by encouraging the patient, but those which are really most effective in combating some one feature of the disease and thus helping to give an impulse

toward recovery are, in the writer's opinion, the following: Absolute rest, provided this can be accomplished under favorable and effectual hygienic conditions agreeable to the patient; surgical treatment of the thyroid or sympathetic nerves.

Twenty-four operations performed for the extirpation of goitre, 15 being total and 9 partial; of the former, 5 proved fatal. In 10 cases no symptoms of cachexia strumipriva or myxœdema have appeared in periods varying from one to four years. Bardeleben (*Deut. Zeit. f. Chir.*, B. 26, H. 1, 2, '88).

Unilateral extirpation performed in 5 cases, with improvement in all. One of the cases had a severe recurrence two years after the operation. Immediately after the operation there was observed a most striking retrogression of all symptoms of the disease. J. Wolff (*Deut. med. Woch.*, Mar. 16, '92).

Statistics of forty-one operations for exophthalmic goitre given, with only two deaths. Those cases classed as surgical in which the nervous symptoms seem directly dependent upon the size and growth of the goitre. Albert H. Freiberg (*Med. News*, lxi, 225, '93).

Operation of extirpation of goitre in Graves's disease is dangerous. Kocher (*Med. Week*, iii, 194, '95).

Ligature practiced in twenty-two cases of Graves's disease. All four arteries tied without any symptoms of cachexia. Rydygier (*Med. Week*, iii, 195, '95).

One hundred and thirty-eight cases in which operation was undertaken. Of these, 114 were improved, 17 cured, and 4 died. Abram (*Lancet*, Nov. 16, '95).

One hundred and eighty-seven cases in which surgical operation was undertaken. Of these, 13 died as the result of the operation, 60 recovered, 47 improved, 11 were unimproved, and in 25 the result is unknown. Kinnicutt (*Med. Record*, Apr. 18, '96).

One hundred and ninety cases of exophthalmic goitre in which some form of operation was done. Of these, 74 are reported as completely cured, many of

them having been watched two or four years before the result was published. Exophthalmos sometimes persisted for a year after operation; 45 of the cases were improved and 3 were not benefited; 23 cases died immediately after operation, and, as hemorrhage was not the cause and careful aseptic precautions were taken, the writer holds that the cause of death is a sudden poisoning of the system by excessive absorption of thyroid juice. This may be due to the manipulation of the thyroid gland or to the increased absorption of torn vessels or to the stimulation by the ether. Local anæsthesia by cocaine should be used instead of ether. Starr (*Med. News*, Apr. 18, '96).

Section of the sympathetic is neither dangerous nor difficult. It powerfully affects the triad of symptoms, and this effect is permanent, especially so after exophthalmos. It can be practiced concurrently with other interventions, provided they have not diminished the exophthalmos. Gayet (*Lyon Méd.*, No. 30, '96).

Operating in exophthalmic goitre by bilateral complete removal of the sympathetic ganglia in the neck advocated. The operation itself is difficult of performance, and in some cases, owing to the fusion of the lower cervical with the upper dorsal ganglia, and to the close investiture of the trunk by important and intricate net-work of vessels, is impossible. While some surgeons, after division of the sympathetic trunk on one side, have observed no pupillary or similar changes, others have. The author has usually found myosis, increased salivary and lacrymal secretion, ptosis, and flushing of the face, but these symptoms were very transitory, and so slight that when the operation is bilateral, and when thus one has no standard with which to compare, they often are quite invisible. Resection of even the whole of the cervical sympathetic trunk on both sides does not necessarily produce any evil result; in exophthalmic goitre the operation is "absolutely indicated." Jonnesco (*Ann. d'Ocul.*, Mar., '97).

Two cases observed in which ablation

of the thyroid gland cured all the symptoms of exophthalmic goitre. When the patients were given thyroid extract, after the apparent cure, all the symptoms returned temporarily. The removal of the gland is easy and devoid of danger, section of the sympathetic is useless and dangerous. Doyen (*Semaine Méd.*, July 29, '97).

Cervical sympathetic excised in three cases. It is a "good operation," but ether should be used instead of chloroform, and the two sides of the neck should be operated upon at different times. Faure (*Rev. de Chir.*, No. 11, Suppl., '97).

Nine cases of section of the cervical sympathetic for exophthalmic goitre reported. The results were good, both with respect to the exophthalmos and to the goitre and palpitations. The best effect was obtained in young people in whom presumably the accelerator system of the heart was less developed and more thoroughly modified by the division of the sympathetic. In cases of failure of the treatment an explanation might be found in the existence of two sympathetic cords in the neck: a not infrequent anomaly. Jaboulay (*Progrès Méd.*, July 31, '97).

Section of the sympathetic pronounced as resultless and unnecessary, thyroidectomy as successful and safe, while the after-occurrence of myxœdema need not be feared, as, out of a large number operated on, only two or three developed this disease. Péan (*Bull. Acad. de Méd.*, Tome iii, p. 31, '97).

If a portion of the thyroid gland be removed, the vesicles of the remainder enlarge, and become altered in shape from round or cubical to oblong or branched; the lining membrane becomes convoluted, the lining secreting cells columnar instead of cubical, and the colloid contents of the vesicles become less viscid and more watery. These changes appear to be identical with those found in the enlarged thyroid of Graves's disease; hence it may be inferred that the typical change in the enlarged thyroid in Graves's disease is of the nature of a compensating hypertrophy. Previous division of nerves has no effect upon

these changes, and hence the enlarged thyroid of Graves's disease is not primarily of central origin. A number of experiments were performed upon dogs, with a view to further determining the function of the parathyroid glands. If a single parathyroid and a minute piece of thyroid proper were left, no symptoms of any kind appeared, whereas death followed if the parathyroid were subsequently excised, although the small piece of the thyroid proper was left. The excision of the parathyroids would thus appear to be the cause of the acute symptoms (tremors, rigidity, convulsive attacks of dyspnœa, and death) which follow the total excision of the thyroids, and that the excision of thyroid proper causes only the symptoms of myxœdema. Edmunds (*Jour. Path. and Bact.*, Jan., '98).

Cases of Graves's disease may be completely cured both by thyroidectomy and bilateral section of the sympathetic. In view of the fact that some cases are cured by internal medication, there must be a certain proportion in which the affection does not induce structural changes in any organ. No theory can be regarded as adequate without taking into consideration the functions of the thyroid gland. Three factors must be considered in the production of the disease: (a) the central nervous system; (b) the connecting fibers,—sympathetic and vagus; (c) the thyroid gland. A lesion of one of these parts may produce a specific alteration in the others, the consequence of which, together with the exciting cause, may give rise to the symptoms of Graves's disease. J. A. Booth (*Jour. of Nervous and Mental Dis.*, Sept., 1902).

The surgical treatment of the thyroid and removal of one or both cervical sympathetic ganglia seems unquestionably to be a treatment of great value, and to be applicable not only in the class of cases called "secondary," where an indolent goitre has been present for some years, but in the "primary" cases as well. The objection to it, as may be stated once for all, is the fact that a large proportion

of the cases have ended fatally, for some unknown reason, so that it should not be adopted without an expressed willingness on the part of the patients and their friends to take a real risk.

Any operative treatment of exophthalmic goitre is likely to be attended by serious and quite special risk. Lejars (*Bull. et Mém. de la Soc. de Chir. de Paris*, Mar., '97).

When we leave these two methods of treatment we come to quite a number which, in my opinion, owe their efficiency, as I have indicated, not to their specific effect, but to their general effect. The treatment of this class which I have found most valuable is persistent faradization or galvanization of the thyroid gland with strong currents. It is, perhaps, going too far to deny a beneficial local action to this sort of treatment of the gland. Certainly it is useful, whatever its mode of action. Through this means a great proportion of the patients presenting themselves at the Massachusetts General Hospital have been treated with marked benefit.

The avoidance of all excitement and emotional outbreaks and a careful regard for the general health must be insisted upon.

The systematic use of the galvanic current is the most important element of treatment. The current should be weak, from $\frac{1}{2}$ to $1\frac{1}{2}$ milliampères, applied for a short time (one to three minutes) every other day. The cathode is applied at the angle of the lower jaw, first on one side and then on the other, while the anode is applied at the back of the neck. After ten or fifteen treatments a steadily-progressing improvement is noted, which may last for years. The medicinal agents comprise the slowly-increasing use of *strophanthus*, beginning with 1 drop of the tincture twice daily and increasing to 10. It is especially indicated where the tachycardia is well pronounced.

Codliver-oil is the best tonic.

The drinking of several pints of pure spring or distilled aerated water daily and a diet of nitrogenous foods mostly are important adjuncts of treatment. William C. Krauss (*Buffalo Med. Jour.*, May, '96).

Good results obtained from the use of the constant galvanic current in the treatment of Basedow's disease. The exophthalmos diminished or disappeared, the general condition improved, and there was diminution of the disordered cardiac innervation and in volume of the hypertrophied thyroid body. Bertram (*Arch. de Ginec., Obst., y Ped.*, No. 5, '98).

The most useful single remedy for this affection is galvano-faradism, the descending stable current being applied so as to include the pneumogastric and cervical sympathetic nerves within the circuit. In the cases in which cardiac symptoms predominate spartheine sulphate and pierotoxin, combined perhaps with the sulphates of iron and manganese, are of value. Roberts Bartholow (*Phila. Med. Jour.*, Apr. 28, 1900).

The other treatments which are occasionally useful are the thyroid preparations, the thymus preparations, and—it is said—the suprarenal extract, all of which should be given in as large doses as can be comfortably borne; cardiac tonics, especially strophanthus, mild diet, and intestinal antiseptics. (See **ANIMAL EXTRACTS: THYROID, THYMUS, and SPLENIC EXTRACTS**, Volume First.)

Sulphate of quinine employed with excellent results, arising from its influence in producing vasoconstriction of the vessels of the head and neck. Fifteen grains of it are given at night after supper, and again a quarter of an hour later. This treatment decreased the tachycardia, diminished the exophthalmos and the size of the goitrous swelling. Paulesco (*Revue de Thér. Méd.-Chir.*, Feb. 1, '99).

Hyoscine hydrobromate ($\frac{1}{300}$ grain), given over a considerable period of time, and of pierotoxin ($\frac{1}{30}$ to $\frac{1}{10}$ grain) have proved useful. Herrick (*N. Y. Med. Jour.*, June 16, 1900).

Cases treated by the administration of serum of sheep from which the thyroid gland had been removed. The serum was administered by the mouth in 5-cubic-centimetre (75 minims) doses. Tablets of the flesh had no therapeutic action. The serum in the two cases in which the writer has tried it has never caused any difficulty, while distinctly improving the condition of the patients. Though the pulse-rate was not materially reduced, the circumference of the neck and the tension of the struma diminished, while the patients slept better and felt more tranquil. Möbius (*Münchener med. Wochen.*, No. 4, 1903).

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EXTERNAL EAR, DISEASES OF THE.—The external ear furnishes about one-fourth of all aural work, by reason of its diseases and anomalies; and, in consideration of the fact that much of our examination and treatment of the middle ear has to be through this channel, its careful study is requisite in otology. Statistical tables show that more than half of these are cases of impacted cerumen, and the bulk of the remainder fall under the convenient—if vague—headings of diffuse, or eczematous, and circumscribed, or furuncular, inflammations; but the rare affections have still enough of pathological interest to call for brief discussion.

Malformations.—Many of the malformations of the auricle have only embryological interest; but the rudimentary microtia is usually accompanied by stenosis or absence of the auditory canal, and the question of operative intervention comes up,—generally for a negative answer. Possibly a crumpled auricle can be straightened out by plastic operation, for more natural growth and a covered bony canal can be opened; yet too often exploration fails to find the canal, and even the tympanum may be undeveloped;

so any opening of the bone is counter-indicated. Otherwise any reasonable plastic surgery may be attempted. The little congenital fistula seen at times above the tragus may suppurate and demand curetting or excision; and auricular appendages or reduplications of the auricle may call for removal.

Injuries.—Wounds, burns, and abscesses (see **FURUNCLE**, below) should receive the usual surgical treatment, the last being rare except in the lobule, where generally due to septic piercing for ear-rings.

Piercing the lobule for ear-rings often leads to secondary infections. Lupus, tubercle, and syphilis are among the maladies thus communicated. Fournier (*Jour. des Mal. Cut. et Syph.*, vi, p. 321, '94).

Fracture of the external osseous canal and its integumentary tissues by force transmitted through the inferior maxilla is not infrequent, and its importance arises from the fact that it may be overlooked entirely, or else mistaken for a fracture of the base of the skull or for a ruptured membrana tympani. Barclay (*Med. Review*, May 12, '94).

Case of infection of the external ear from vaccine inoculation. The poison was conveyed from the arm of an infant by the nurse to her own auditory meatus. Recovery ensued in three weeks, leaving a characteristic scar in the lower wall of the auditory canal. Szenes (*Germ. Otol. Soc.*; *Arch. f. Ohrenh.*, Sept., '95).

Purulent otitis, erysipelas, adenitis, impetigo, syphilis, lupus, and simple supuration which by extension may become severe and even threatening in its consequences, may all result from the piercing of children's ears without proper antiseptic precautions. Rocha (*Jour. de Clin. et Thér. Inf.*, Feb. 6, '96).

Case of gangrene of the ear in which the necrotic process involved both anterior and posterior surfaces of the concha. S. S. Bishop (*Jour. Amer. Med. Assoc.*, Mar. 28, '96).

In the majority of cases it is impossible to diagnosticate fracture of the auricle by simple visual examination; but manipulation with both hands—one grasping the pinna and the other the lobule—will elicit crepitus, and if transillumination is used the line of fracture can be readily made out, especially if inflammatory changes have not progressed to any great extent. Lewis S. Somers (*N. Y. Med. Jour.*, Jan. 22, '98).

Hæmatoma and **perichondritis** are often of traumatic origin, each marked by effusion between the perichondrium and cartilage with serious impairment of its vitality. Deformity is apt to follow; but early relief of tension and judicious use of massage are our best measures for cure of mitigation. Any inflammatory symptoms, such as usually differentiate these otherwise similar affections, are to be allayed before much stimulation is attempted.

Interesting case of hæmatoma of the ear seen in which the staphylococcus pyogenes aureus was found. J. Justin McCarthy (*Maryland Med. Jour.*, vol. xxxvii, No. 3).

Ossification of the auricle rare, and in the very few cases on record it has resulted from senile changes, but writer had case in which it developed in consequence of perichondritis sero-purulent. H. Knapp (*Archives of Otol.*, Jan., '90).

Importance emphasized of distinguishing between an ordinary cystic tumor and othæmatoma; that such tumors produce deformity is, most frequently, on account of the heroic measures resorted to for their removal. Lavrand (*La Semaine Méd.*, May 7, '92).

Most cases of so-called primary perichondritis of the auricle are in reality instances of cutitis and lymphangitis of the outer ear. This leads to altered nutrition in the perichondrium and the cartilage. A. Courtade (*Ann. des Mal. de l'Oreille*, Aug., '94).

Growths.—Cysts are generally back of the ear and more commonly congenital, however late the apparent beginning.

They may be serous, sebaceous, or teratoid, and should be dissected out entire.

Cysts of the auricle treated by electrocautery applications. The cyst is opened by incision, its contents allowed to escape, and the sac washed with sublimate solution. The walls are then curetted, and an electrocautery point, made into the form of a small button of platinum, introduced into the sac and the walls seared. The interior is then washed out with sublimate solution and a compress applied, covered with iodoform gauze. The parts heal quickly, and with slight or no deformity. Albespy (*Revue de Laryn., d'Otol., et de Rhin.*, Dec. 15, '92).

Fibroma of the lobule is usually a keloid formation sequent upon piercing or the wearing of irritating rings; it is therefore commoner in the negro. It is not apt to attain great size and seems always benign; but thorough eradication is the only safeguard against prompt recurrence.

Great frequency of fibrous tumors of the lobe in negroes attributed to the wearing of brass jewelry. Impaction of cerumen is of rare occurrence, not only on account of the large size of the meatus, but also because such collections are seldom found in plebeian ears. Turnbull ("Impaired Hearing").

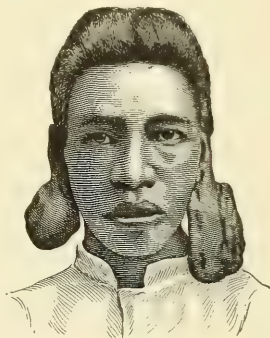
Two cases of lupus seen, the result of perforation of the lobules for ear-rings. Fournier (*Jour. de Méd.*, July 15, '94).

Case of tumors of the auricle observed. The growths, shown in the accompanying illustration, were fibrous tumors of the lobules, resulting from an inflammatory process induced by piercing the lobules for ear-rings. Bullard (*Virginia Med. Monthly*, Sept., '95).

Keloid occurs more frequently in the negro than in the white race, and is not due so much to the size or nature of the rings worn in the ear, but to the inherent tendency of this race to the formation of fibroid tumors. The tendency to recur is very great. Scheppegrell (*N. Y. Med. Jour.*, Oct. 17, '96).

Other neoplasms are too rare to need discussion.

Eczematous inflammation of the auricle is commonly due to its extension from the canal, where it has been set up by irritating discharges. Intertrigo back of the ear or isolated affection of the pinna or canal has often other causes; and in the absence of otorrhœa, gout, or struma, or other malnutrition, is apt to be its basis. It may be a severe affection, with pyrexia and almost phlegmonous swelling; and in such cases it is wiser to isolate, give full doses of tr. ferri chlor., and deal with it as erysipelalous. Locally there are generally abundant micro-



Fibrous tumors of the lobules. (Bullard.)

organisms; and whether these are causative or not, we should, with all promptness, remove the conditions favorable to their growth. Moisture is to be avoided, as well as any oily materials which might decompose and irritate; and any weeping of the surface should be dried by vigorous use of silver nitrate. Bismuth, calomel, hydrarg. oxidi flavi, or ichthyol in weak ointment should relieve the irritable conditions; oil of cade or more stimulating salves, the more chronic phases. As a prelude to any treatment, the affected surface should be cleaned as perfectly as possible of all crusts or desqua-

mation, hydrogen dioxide being probably the best agent, since it also penetrates and disinfects, while bringing to view, as snowy patches, affected areas beneath the surface. The chosen ointment should then be rubbed in, gently, but persistently, until these deeper patches have been again made invisible by its penetration. The prescribing of medication without supervising or personally carrying out the employment of it will generally prove ineffectual. The affection is often stubborn at best and prone to recur, and strict regimen and constitutional medication may be requisite to ward off attacks. Herpes may, in very rare cases, be mistaken for it; but the pain in herpes is apt to be severe before any eruption and the course of the affection is quite different.

Herpes at the orifice of the external auditory canal cured by tonics and the local application of yellow oxide of mercury. L. S. Somers (Am. Medico-Surg. Bull., Oct. 31, '96).

The itching of eczema is as trying in the canal as in any other location, and there is a strong temptation to scratch, abrade, and infect the surfaces. Furuncle is apt to follow, and autoinoculation may establish a series. As elsewhere, there are two sets of glands open to involvement: the superficial sebaceous hair-glands and the deeper coiled glands, here secreting cerumen instead of sweat. The latter may actually enter the perichondrium or periosteum; so their supuration may not only cause swelling of the whole aural region and displace the auricle in a way suggestive of mastoid abscess, but may really cause caries of the bony wall. Hence slight eczemas deserve treatment as a prophylaxis, even when no redness or desquamation marks their existence.

In eczema of the auricle and external auditory canal the use of a wash of Van

Swieten's solution, diluted with three or four times its volume of water, recommended. The parts are then dried with absorbent gauze, and dusted, morning and evening, with iodol. This form of treatment is of service in case of "moist eczema." For "dry eczema" after using the wash, as above, the parts are dried, and the following ointment is applied: Iodol, 15 grains; lanolin, 1 ounce. Chatterlier (Annales des Mal. de l'Oreille, etc., July, '93).

Induration is present in most chronic eczemas, and the resulting rigidity of the auricle and canal is often our only diagnostic sign. Something of this sort will generally be found in the other ear when one only is affected with furuncle. The right ear is more often affected in adults, probably as it is more often scratched.

Furuncle may be extremely painful and a series occurring in a patient out of health may positively endanger life through exhaustion. The first appearances should be vigorously treated, therefore, and the later stages sedulously cared for until resolution is complete.

Furuncles often appear after the removal of impactions of cerumen. For this reason a boric-acid wash should be applied before removing such masses:—

R. Acid. boric., 45 grains.

Glycerinæ et aq. destil., 1½ ounces.

Twice daily, for one or two days before the final syringing for removal of the impaction, this solution is instilled into the affected ear. Loewenberg (Jour. de Méd. de Bordeaux, May 12, '89).

Staphylococcus pyogenes produces furuncles. They are forced into the follicles of the skin usually by mechanical irritation. Schimmelbusch (Archiv für Ohrenh., '89).

Furuncles of the auditory canal are associated frequently with general furunculosis; in the majority of cases the *staphylococcus pyogenes aureus* is the offending micro-organism; next in frequency, the albus and citreus. Mag-

giora and Gradenigo (*Giornale della reale Accademia di Med.*, Torino, July, Aug., '91).

Gout is a frequent cause of furunculosis. When arising from this disease, the inflammation in the canal is relieved by the following treatment: The ear is to be washed with an alcoholic solution of boric acid; it is then painted with a solution of bichloride of mercury,—1 to 2000; the parts are then to be covered with a preparation of the yellow oxide of mercury in vaselin. Internally, the patient is given liquor potassii, U. S. P., 10-drop doses in water; also, quininæ muriatis, 2 grains until 8 grains have been taken, if there is very severe pain of neuralgic character. The diet is to be regulated strictly, so as to exclude all saccharin articles. Lawrence Turnbull (*Times and Register*, Oct. 3, '91).

A cotton-wool tampon is made of uniform diameter, and of such a thickness as to fit tightly into the inflamed meatus, and long enough to reach the drum. The tip of the tampon must be cut straight across, so as not to taper. It is dipped in the following ointment:—

Oxide of zinc, 40 parts; carbolic acid, 6 parts; white vaselin, 300 parts; then warmed and dipped, and warmed three times. The tampon is then pushed into the meatus with a screwing movement, and, after removal of the probe, is left for twenty-four hours. The plug is removed at the end of this time, and the patient can renew it twice daily. This treatment gives better results than any other. Lamann (*Monats. f. Ohrenheilk.*, Feb., '99).

The hearing is unlikely to be involved except temporarily; but the condition should not be too lightly regarded or the sufferer may seek a more sympathetic attendant. Leeching may greatly relieve the painful tension and abort or limit the lesion; heat, dry or by douche, is generally more convenient and as efficacious. The temperature should always be hotter than pleasant and the douche should be followed by drying, to avoid maceration. Poulticing is to be con-

demned, unless done for very brief intervals and only at the hottest bearable. Granulations about the mouth of an open furuncle are almost as certain evidence of abuse of poultices as is a "tea-leaf eye." Disinfection by mopping with hydrogen peroxide gives the benefit of massage, and should be followed by rubbing in of ung. hydrarg. ox. flav. This should not only be rubbed in as vigorously as can be borne, but should be inserted on a conical wad of cotton wedged in as firmly as can be tolerated. If the patient will bear this for the first few minutes, it generally reduces the congestion and brings relief; and it can even be pushed in more and more so as to maintain pressure. A persistent inunction and massage is thus obtained at every motion of the jaw; and a canal that was wholly closed one day with a furuncle that threatened days of suffering may be found open and well on toward resolution next day. In the deeper form of the involvement such pressure cannot be endured. Heat will here have a limited value, and instillations of atropine, cocaine, morphine, carbolic acid, or a thousand vaunted remedies may avail as little. Morphine in full dose must be called in, therefore, to supplement the resolvent effect of heat by douche and hot-water bottle. Bags of salt retain heat well and can be used to good advantage, as can the Japanese hand-stove if its fumes are avoided. Incision of the swelled tissue, whether pus has formed or not, is in theory unimpeachable; in practice it can be generally avoided with moral and physical relief to the patient and an impression that the healing has been better without it. Diagnosis of the conditions beyond the swelling may be impossible, and tympanic involvement had better be assumed until it can be disproved; hence swellings in the bony canal, where glands are few and

furuncle rare, should be earlier incised; and the possibility of underlying bone-disease never lost sight of as a cause rather than a consequence of the visible lesion.

Good results in the treatment of furuncles obtained from the use of solutions of menthol. Ten-per-cent. solution of menthol is sufficient to stop the development of staphylococci. For clinical use a solution of 20 per cent. recommended. A wad of cotton, moistened in this solution, is to be placed in the auditory canal so as to cover the diseased parts. These wads should be renewed once in twenty-four hours and the treatment continued until the affection is overcome. R. Cholewa (*Ther. Monats.*, June, '89).

When the parts cannot be incised in furunculosis, the auditory canal is to be cleansed with an antiseptic wash. A small layer of cotton is then soaked in a 20-per-cent. solution of the subacetate of alum, and is placed as deeply in the canal as possible. This is covered with a layer of dry cotton, and one of rubber outside so as to maintain the heat and moisture of the inner pledget. Grünwald (*Münch. med. Woch.*, Mar. 3, '91).

The opening of furuncles in the ear, which is one of the most painful of small operations in the whole of minor surgery, can be made absolutely painless by cataphoresis. Use is personally made of the street-current, 2 to 4 milliampères being used for ten to fifteen minutes. Joseph Kenefick (*Med. News*, Dec. 30, '99).

Early incision of the furuncle is advocated and the application of an ointment which Dr. Barr recommends—iodoform, 4 grains; menthol, 2 grains; vaselin, 1 drachm—smear on cotton plugs, and introduced into the canal of the ear twice or thrice daily. Gruber's gelatin bougies containing morphine are also of service, more especially in the earlier part of the illness or if the patient will not allow the boil to be incised. Poultices generally do harm.

If the furuncle is not a primary condition, but occurs associated with some other lesion—suppurative middle-ear

mischieff, eczema of the canal, or plugs of cerumen—these conditions would demand appropriate treatment. In a furuncle associated with purulent otitis media, one is occasionally surprised to note how quickly the middle-ear discharge dries up after the inflammatory condition in the outer canal has been remedied.

The constitutional treatment of this affection is of prime importance. The dietary must be carefully regulated: starchy and sugary foods should be withdrawn. Tonics and aperients may be necessary. The aim in view should be a plain, wholesome, nourishing diet, with plenty of out-door exercise.

The tendency of bromides and iodides to produce a pustular eruption must be borne in mind. Alum and nitrate of silver applied locally are also said to favor their development. J. G. Connal (*Glasgow Med. Jour.*, July, 1901).

Granulation-masses may be found in the canal, arising from its wall. Unless fringing the opening of a poulticed furuncle, these generally mark a sinus leading to or into the bone. There may be a burrowing out of tympanic pus along the periosteum by a track which a bristle could hardly follow; but generally a fine probe will find its way to bare and carious bone. A superficial lesion should be laid open and curetted, as cocaine will generally enable us to do with sufficient vigor. A deeper lesion will belong to the field of middle-ear surgery, not here treated.

The tendency of perforations of the drum is to heal by granulation, but in some cases the formation of an overlying epithelial tissue acts as a restraint to the granulating process. In all such cases Okuneff recommends to simply burn off the epithelial tissue with trichloroacetic acid. The subjacent granulating tissue then readily closes the breach. Five complete recoveries in seven personal cases, the remaining two being still under treatment, recorded. Peltesohn (*Berliner klin. Woch.*, Apr. 17, '99).

Inspissated cerumen constitutes about one-seventh of the aural disorders. It is rarely a condition that can be regarded as merely an incidental retention of normal ear-wax, nor does the dirty occupation of even the coal-heavers who are affected with it more than partially explain its occurrence. There is generally more or less involvement of the middle-ear behind it; and the *decreased* amount and greater consistence of the excretion is often, as in the pharynx, the reason for the apparent increase of its amount. Wax is generally wholly lacking in suppurating ears, although brownish inspissated pus is easily mistaken for it; and in the chronic tympanic catarrhs it is generally a very good omen when wax begins again to form in the usually empty canal. Faulty configuration sometimes hinders its natural escape; but generally this is associated with an eczema which adds much exfoliated epidermis to the collection. The wax-glands are situated only in the outer two-thirds of the canal; so any wax found deeper is a foreign body, generally pushed there by meddling attempts at its removal.

The healthy ear needs no artificial cleansing of its canal. Nature has provided that the epithelium of the centre of the drum-head shall grow faster than at any other point; hence it tends to overgrow its surroundings, as it were, and, pushing the older cells before it, to creep along the canal-wall. Superficial extravasations on the drum-head can thus be seen to migrate off its surface and a little way along the canal, before they are thrown off; and this outward growth carries all foreign material away from the tympanic membrane, where it might seriously impede function. Outside of the narrowed "isthmus" of the canal the wax-glands are present, and one of the functions of the wax is doubt-

less to agglutinate the flaky material. The motions imparted by the jaw to the lining of the canal is then probably all that is needful to convey these particles to the exit,—the spring of the hairs upon which they get caught serving to throw them at times out upon the shoulder.

Excess of wax in the external meatus may be caused by (a) frequent hyperæmia of this region; (b) contraction of the meatus; (c) improper cleaning of the external meatus by inserting the twisted corner of a wash-rag or towel or similar contrivance into the ear. Parents and nurses should be especially warned against mechanically irritating the lining of the canal by undue cleanliness, and it should be pointed out to them that if the concha be wiped out with a soft, moist rag the canal will take care of itself, and that anything introduced into the meatus is likely to do harm and result in anything but the desired cleanliness. Stout (Proceedings Phila. County Med. Soc., Mar., 1900).

When, through defect of this natural cleansing process or artificial interference with it, collections form within the canal, they are commonly at the middle third and may fill almost completely this tube; but so long as the smallest crevice remains through which the sound-waves can reach the tympanum there may be no symptom of their presence. Pressure may be noted or other irritation lead to interference, and then the mass may be pushed down upon the drum or made to occlude the meatus. More often the entrance of moisture swells the hydroscopic mass; and sudden and complete closure of the ear, with deafness, tinnitus, and autophony may alarm as well as distress the patient. Sudden deafness without pain or vertigo is apt to signify impacted cerumen.

History of a patient is given in whom tinnitus was so intense and took such definite shape (threatening, or devilish

voices, etc.) as to induce great mental depression—not, however, giving rise to systematized delusions. Twelve hours after the removal of masses of inspissated cerumen and pieces of tobacco from the ear, the “voices” disappeared entirely and were not noticed again. This case illustrates how certain abnormal mental states may be induced by the mere presence of foreign bodies in the auditory canal. Editorial (*Mass. Med. Jour.*, July, '91).

Occurrence of ear-cough, deafness, vertigo, and nausea from the presence of hard cerumen in the ear. In nervous persons a melancholic form of dysthymia may be produced by mechanical irritation in the external ear. R. W. Merrie (*Brit. Med. Jour.*, Oct. 10, '96).

The opposite ear is commonly in similar condition; so the habit of examining it first may save us from letting the same experience befall the patient there. A dark-brown or blackish, greasy mass can usually be seen at the first glance, even on drawing the canal straight and letting the light from a window fall into it past the examiner's head. Sometimes the hairs are enough to hide it and must be pressed aside with a speculum. This must here, as always, be used only under good illumination of the canal or it may serve to press the mass all the more distressingly. In all these examinations, as also in all manipulations in the canal, the normal configuration of the meatus must be borne in mind. It has an oval lumen with the longer diameter vertical at the exit but inclining forward as we go in. Its axis is spirally curved and tends usually upward and forward as we pass in, but the floor seems to sink a little as we approach the drum-head, constituting a slightly broadened, deepened sulcus, out of which foreign materials are rather hard to remove. The soft parts constituting the outermost third of the canal exaggerate the curves and have to be drawn up (down, in the infant) and

back and out in order to straighten it as much as possible, both for seeing in and for washing out anything there retained. The helix should therefore always be grasped between the index and middle fingers, so that this traction may be efficiently made, and yet the thumb and index-tip be left free to manipulate a speculum or otherwise serve us.

Wax plugs and all other foreign bodies should be washed out with the syringe. Only where this has been fully and skillfully used without avail has the most expert a right to employ other instruments; and then only with a gentle, steady hand and on a quiet or etherized patient. In almost all cases the syringe is the most efficient as well as the safest and gentlest means at our command; but it must be better used than commonly, if it is to justify this claim. A small, smoothly-working piston-syringe is to be preferred, with a small tip that can enter a little way into the canal without obstructing the view. The fluid employed should be hot water. It matters little or not at all whether this is medicated; soda, boric acid, or any harmless drug may be dissolved in it if the surgeon believes it better than pure water. The best solvent is really heat; and a temperature of 110°-115° F. is generally well borne and less apt to cause dizziness than “luke-warm” water. A cup of some sort should be held beneath the lobule and the shoulder covered with a towel; then with the canal well illuminated by the forehead-mirror or other means and drawn straight as above described, we gently begin to inject the hot water. Perhaps along the upper back wall is the best direction for the stream; but this must be varied as sight of the mass suggests. Beginning gently, the first few drachms serve to moisten the parts, the next to disintegrate the plug, discoloring

the returning fluid with the dissolved wax; usually with my two-drachm instrument the eighth syringeful washes the mass out into the cup, with an expenditure of 2 ounces of water and five minutes, at most, of time.

But epidermis is not soluble in water or any other available material. When the impaction consists largely of laminated epithelium, especially if really a cholesteatoma-mass working out from the middle ear, no such easy task is to be anticipated. Prolonged syringing, aided, perhaps, by skillful use of the probe and forceps, must be employed to remove such a mass, and prudence may dictate adjourning the completion of the matter to a second sitting. The canal-walls are often excoriated beneath such a mass, and exfoliating, but not yet fully-detached, epidermis may anchor it to tender surfaces, from which it should not be violently torn away. But in true cerumen-impaction there is little or none of this. Delay in soaking or otherwise trifling with the plug only increases any irritation from its pressure. The patient, if put off, may never return to the surgeon whom he truly says made him worse instead of better. Dizziness or fainting may compel a suspension of the sitting; but if the patient has been warned to announce the first sensation of the sort, this can generally be forestalled; and an eye should generally be kept open for any clammy sweat on his brow. Pressure upon the tympanic structures is a common cause; and suction with the squeezed Politzer bag fitted in the canal will often undo the mischief and give instant relief. If not, the patient should be laid flat by tilting his chair back until the head is on or near the floor and induced to lie still until feeling right again; when the chair can be raised again and we can

proceed in a few moments without repetition of the disturbance.

After this and all other syringing, the canal should be gently dried with absorbent cotton on a delicate carrier and the air shut out by a light flake in the exit; otherwise there will be chilling from the evaporation of the trace of moisture left, with possibly unpleasant reaction. Any excoriated surfaces should be dusted with boric acid or aristol; and any needed treatment given to the nose, throat, and middle ear.

In the removal of cerumen instruments such as probes, hooks, etc., should be absolutely avoided.

The syringe should be thoroughly sterilized and capable of containing about three ounces and a quarter of liquid. The extremity should be very fine and perfectly cylindrical. It is well to attach a soft-rubber tube a centimetre long to the end, to prevent injury to the passage. Water that has been heated to 98° F. should be used, but it must not be applied too hot. In administering the injection, the end of the syringe should be directed along the upper wall of the meatus. The first injection should be made very gently, in order not to cause vertigo. If no symptoms occur, from 5 to 6 syringefuls may then be injected.

If the cerumen does not become loosened, violent syringing must not be resorted to. The cerumen must then be softened, and the following solution is recommended:—

℞ Sodium bicarbonate, 15 parts.
Glycerin,
Water, of each, 300 parts.

Six drops of this solution are to be warmed and dropped into the ear three times a day; a tampon of cotton is placed in the ear after each instillation.

At the end of forty-eight hours fresh injections may be repeated, and, if the lump is still immovable, the instillations are again resorted to.

After the extraction, the ear should be thoroughly dried and a small tampon of cotton placed in the entrance and

allowed to remain there for two days. Laurens (*Presse Méd.*, Feb. 19, '96).

Foreign bodies in the ear are not common or important except as furnishing to incompetent and rash attendants opportunity for improper and sometimes most injurious interference. Let alone, none but gunshot missiles or living insects can often occasion the slightest damage, except as forming nuclei for subsequent collections of cerumen.

It is the injury inflicted in efforts to remove them that is responsible for numerous untoward results, occasionally fatal. Rarely will any such object be thrust primarily beyond the cartilaginous portion of the canal, whence its extraction by any competent method should be easy. It is only after family or friends or incompetent medical man has pressed it deeper and too often wounded or irritated to marked swelling the tissues about it, that the condition assumes any importance. Then the panic which assumes that it "will certainly go to the brain" must first be allayed; the patient quieted to bear examination, which previous abuse has taught him to dread; and the ground clearly taken that the intruding mass will be at once removed only if this can be safely done. To counsel delay *after* failure is apt to seem a reason for immediately seeking another and more vigorous attendant. Careful examination should first be made to determine the presence of the alleged foreign body, and this should begin with the other ear, not only that the configuration of the parts may be noted, but because in the excitement one ear may be receiving attention belonging to both or to the other alone. If there is, in fact, a body to be removed, the syringe and water of about 105° F. should be used as above directed, and, unless there has been very bad mishandling, there is likely to be little difficulty in washing out the intruder.

Should there be firm impaction in the bony canal or such swelling of the soft parts as to defy this procedure, it is best to use the water hotter still to reduce the inflammation and then to wait until the conditions are more favorable. Urgent symptoms may forbid this delay; then if vigorous syringing is unavailing, other instruments, such as a fine loop of wire or a blunt hook, may be tried in skillful hands, usually under general anæsthesia, unless the patient is in perfect control. All but specially adapted forceps are commonly worse than useless and apt to force the body deeper. The agglutination-method may suit those who fear to use water lest it swell some bodies and cause seeds to germinate before they can be removed; but hours can rarely be spent over such matters. If the body really needs removal it is safer to lay the soft parts forward by a free incision behind the auricle, and in the shorter and wider naked canal to use efficient leverage or bold chiseling to free and extract the mass. The injury thus surgically inflicted should be healed in a week; what will be done in blindly groping in the depths of the ear may never be repaired, and the life as well as the hearing may be sacrificed by such "conservatism."

If after syringing vainly an impacted seed it is decided to wait for reduced inflammation, a few drops of carbolated glycerin will serve as a sedative astringent and will dehydrate the seed as much as hours of syringing could swell it. So the science of those who syringe with substitutes for water is as wasted as that which floated up leaden shot with mercury instead of turning the ear down to let them fall out. Gravity can often be utilized in thus inclining the head, and gentle rotary rubbing in front of the ear will often coax out the foreign body.

An air-douche with the Politzer bag or other means will sometimes best remove light substances, proving as efficacious as the old-fashioned, but reprehensible, "box on the ear" which has sent many a cherry-stone or pebble flying out across the room. The ear should be directed downward, drawn straight and relieved of any pressure of the jaw-condyle by opening the mouth.

Method which is simple and may be quite effective in cases where the body is not wedged too tightly in the canal or has been surrounded by a ring of swelled tissue. Some gutta-percha is melted in an iron spoon, and with a fine probe of iron wire, having a small ring at its extremity, some of the liquid gutta-percha is taken up and passed into the auditory canal; the gutta-percha is applied to the foreign body and held against it until the latter is firmly adherent. The probe is then withdrawn, bringing away the foreign body sticking fast to the gutta-percha head. Guillaume (*Union Méd. du Nord-est*, Dec., '93).

Foreign body forced into the drum-cavity from the external ear, followed by rough extraction, great irritation, tetanus, and death. Schmiegelow (*Archiv f. Orenh.*, B. 59, May, '95).

If a living insect has entered the ear, a few drops of sweet oil will smother it, and it may then be syringed out with warm water. If an inanimate substance has been placed in the ear, syringing with warm water will generally remove it if the ear has not been previously scratched by probes or forceps. If the latter has been done, the child should be etherized and the foreign body removed by an expert. There is no hurry demanded in such cases. The foreign substance had better be left in the ear indefinitely than to apply rough measures for its removal. Death has occurred by unskillful efforts to remove a foreign body from the ear of a child. Not the foreign bodies in the ear, but the improper treatment, is the cause of death in such cases. Burnett (*"Amer. Year-book,"* p. 835, '96).

There is no reaction between the

normal auditory canal and the foreign body placed in it; as such, the foreign substance is unattended with danger. Therefore, every hasty endeavor at removal is not only unnecessary, but may be injurious. 1. In all cases in which no rough endeavors at removal are made, syringing with warm water is sufficient to remove the foreign body. 2. The general physician should never employ anything but the syringe to remove foreign bodies from the ear. 3. An instrumental removal should never be attempted by anyone but a specialist skilled in the use of ear-specula and the technique necessary in such cases. Hummel (*Münch. med. Woch.*, Apr. 27, '97).

Attention drawn to the dangers attending the attempts at extraction of foreign bodies impacted in the external auditory canal when these efforts are made under the conditions of imperfect knowledge of the parts dealt with, the use of improper instruments or the lack of proper illumination of the operative field.

In all early cases, seen at first hand, the primary attempt at extraction should be made with the syringe, and should the first attempt fail, this treatment should be successively repeated, unless it is found that, in consequence of a perforation of the drumhead and escape of the fluid through the Eustachian tube, this measure is negated.

When it has been definitely determined that removal of the foreign body by means of syringing is impossible, instrumental manipulation may be resorted to, but only under conditions of good illumination and with instruments which may be passed beyond the foreign body, between it and the canal wall, without injury to the deeper seated parts. If instrumental manipulation is found to be ineffectual without danger to the soft parts, the auricle should be reflected forward and the body extracted.

In the event of previous attempts at extraction which have resulted in injury to and swelling of the canal walls, this swelling should be allowed to subside before further attempts at extraction are made. In the case of symp-

toms which demand immediate interference and extraction, either through the lumen of the canal or post-aurally, this should preferably be done under an anæsthetic. Leutert (Archiv f. Ohrenheilk., Vol. lxi, Nos. 1 and 2; Amer. Jour. Med. Sci., July, 1904).

Otomycosis or the growth of aspergillus or other molds in the auditory canal is a rare affection, practically an eczematous inflammation with this infection as an accidental sequence and persisting irritant. Such organisms cannot flourish in a dry ear. It should be well cleansed and rigorously mopped with hydrogen dioxide, then dried with all thoroughness, and dusted with boric acid. Instillation of borated alcohol may

precede this last, if it does not irritate too much. In the very rare instances when a few repetitions of this procedure fails of complete success, some of the many other commended drugs may be tried. As the growth may have penetrated deeply into the epithelium, no single treatment can be trusted to have destroyed every hypha and spore; and a non-mycotic eczema may remain to be cured. Exostosis and hyperostosis are generally self-limiting affections, very rarely in America calling for operation, and other new growths are too infrequent to call for special discussion.

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FATTY HEART AND OBESITY.

Definition.—The term “fatty heart” embraces two pathological distinct affections: (1) *fatty infiltration*, in which there is an abnormal accumulation of fat about the surface of the organ and in the interstitial tissue, and (2) *fatty degeneration*, by which is meant the transformation of the cardiac muscle-fibres into fat. Both conditions are frequently concomitant to general obesity.

Fatty Cardiac Infiltration and Obesity.

Symptoms.—A well-marked degree of fatty overgrowth may be unaccompanied by any symptoms, although the bodily vigor may be impaired. These cases are usually combined with general obesity. The muscle-fibre is weakened (not degenerated, as a rule), and as a consequence dilatation of the organ tends to supervene; this excites dyspnœa upon exertion. Under these circumstances, if extra labor is suddenly thrown upon the organ, from any cause whatsoever, the clinical indications of a weak heart (urgent dyspnœa, præcordial discomfort,

palpitation, vertigo, syncope, cyanosis) promptly appear and become pronounced, followed later on by recurrences on every provocation.

In cardiac arrhythmia, so frequently observed in the obese, the apprehension of grave disease of the circulatory and respiratory apparatus usually entertained is not warranted. Slight intermittence after a series of regular beats, followed by a pause, is observed in youthful patients with slight heart-trouble, especially in young girls who exhibit the anæmic form of lipomatosis. Actual irregularity, in which regular beats and pulse-pauses alternate, is seen chiefly in fat people who have already passed their fiftieth year, and in whom other symptoms of heart-trouble are present. Complete irregularity, in which pulse-waves alternating in tension and size regularly follow one another, is seen in cases of obesity with marked heart-weakness, in which there is dyspnœa, angina pectoris, œdema, and dropsy. Simple cardiac intermittency and slight irregularity are not unfavorable as regards prognosis, and these cases may, after a course of treatment

directed to adiposity, recover their pulse-regularity. The occurrence, however, of complete irregularity, *delirium cordis*, regarded as a sign of grave disturbance of the heart-mechanism which can never be completely removed, and sometimes also premonitory of sudden death. Kisch (Berliner klin. Woch., Mar. 18, '95).

Distressing attacks of asthma may develop after a full meal, or in the absence of any apparent exciting cause. A passive form of bronchitis, probably secondary to a weak heart, attended with the customary symptoms—cough and a slightly-colored expectoration—often arises.

Inspection shows a feeble, diffuse apex-beat, though in marked obesity I have frequently found it absent. Palpation serves to confirm the existence of a feeble impulse. The radial pulse is variable, though, as a rule, regular and moderately tense. Percussion yields dullness over an increased area, although this is not demonstrable in excessive obesity. Auscultation renders audible the feeble heart-sound in marked cases, and, with increasing dilatation, a systolic murmur. In moderate grades the heart-sounds may be clear.

The catabolic disorders of obesity ascribed to faulty thyroid activity are due to: (1) disappearance of the thymus gland and marked development of the thyroids at the period of puberty; (2) the more frequent occurrence of thyroid affections in girls than in boys, which fact tends to explain the analogy,—greater frequency of transitory obesity of adolescence among the pubescent females; (3) our physiological and clinical experience as regards increase in protoplasmic oxidation after administration of thyroid gland or its preparations. Heinrich Stern (New York Med. Jour., March 29, 1902).

Differential Diagnosis.—The diagnosis rests upon the combined presence of marked obesity and a weak heart. Al-

though there is little danger of confounding fatty overgrowth with other cardiac affections, the fact is to be kept in remembrance that its persistence favors the occurrence of fatty degeneration, and it is not always possible to discern the sequence, since, as will appear hereafter, fatty degeneration may exist without engendering symptoms.

Even marked degrees of acute fatty metamorphosis of the heart cannot be diagnosed during life, because the fatty change does not materially influence the function of the heart, nor does it produce any striking cardiac symptoms. The working capacity of the acutely degenerated heart suffers but little, and the fatty organ is capable of responding like the normal heart, both to ordinary and to increased demands. It is not warranted to attribute the frequently observed attacks of cardiac depression to fatty degeneration of the heart-muscle. In the vast majority of cases the fatty change is a consequence, and not a cause, of loss of compensation. Hasenfeld and Fenyvessy (Berliner klin. Woch., Feb. 13, '99).

The urine of 996 obese patients examined, and sugar found present in 10 per cent. of that number. The percentage of diabetics seems to increase with the degree of obesity. Wolfner (Berliner klin. Woch., Jan. 28, 1901).

Certain points of distinction will be found in the division on fatty degeneration (*vide infra*).

Etiology.—The chief etiological factor is general corpulency. Among conditions *predisposing* to fat-production may be mentioned: (a) Heredity: in about 50 per cent. of the cases of obesity the tendency is inherited, and in these the abnormal accumulation of fat shows itself quite early in life. (b) Climate: corpulence occurs with relatively-increased frequency among the inhabitants of hot, moist countries, and of low countries of the temperate and arctic regions. (c) Habit and occupation: the sedentary

habits of the rest-loving, phlegmatic temperament predisposes to fat-increase, while all sedentary occupations act in a similar manner. (d) Race: Jews are particularly subject to obesity, and the same may be said of races inhabiting certain hot, moist climates (*vide supra*); e.g., southern Italians, South-Pacific Islanders, and certain African peoples. (e) Age and sex: acquired obesity most frequently arises in persons of advanced middle life, between 40 and 50 years, while the congenital form is seen in infancy and childhood. The fat-heart is never found in infancy (Cutler). Corpulency is more frequent among women (particularly Jewesses) than among men, and in the former sex it often appears at puberty and between the thirtieth and fortieth years. (f) Certain diseases and conditions may predispose (anæmia, paraplegia, and loss of blood and other fluids).

It is not absolutely necessary that tuberculosis in man be associated with loss of flesh. Virulent tubercle bacilli cannot only live for years in apparent robust health, but they may in addition very much increase their adipose tissue. Queyrat (Gaz. des Hôp., No. 87, '97).

Apart from idiosyncrasy, deficient lung-capacity is, perhaps, the most frequent cause of overfatness. Editorial (The Dietetic and Hygienic Gazette, Jan., '98).

(g) Congenital anomalies and monstrosities (idiots, cretins, acephali).

The exciting causes may be tabulated as follows: 1. Inebriety; the intemperate use of alcoholic beverages, especially in the form of beer, ale, porter, and the like. 2. Ingestion of fat-making food in excess. Excessive use of fats, starches, and sugars, although the too free indulgence in proteids may also be responsible, especially with insufficient physical exercise. 3. The prolonged use of arsenic may sometimes lead to corpulence.

Practically all of the experimental evidence in favor of the origin of fat from proteids, either physiologically or pathologically, is based on false premises. Neither a physiological nor a pathological formation of fats out of proteids has ever been demonstrated, although the possibility of its occurrence cannot be absolutely denied. The weight of evidence at the present day is in favor of infiltration or the formation of fat from carbohydrates. A. E. Taylor (Amer. Jour. Med. Sciences, May, '99).

Pathology.—The characteristic change consists in an abnormal deposit of fat, more especially in places where this tissue-element is normally found, as the aurico-ventricular grooves, near to the apex, and about the great vessels at the base. This overproduction of fat is present in every obese person, and when excessive may form an enveloping mantle, first covering the right ventricle, later the left also, attaining a diameter of an inch or more. The surface of the fat-heart generally presents a pale-yellow hue, but may be a deep-yellow color, resembling sulphur. The intermuscular fibrous tissue, as may be seen on section, is the seat also of increased accumulation of fat. In extreme cases the muscular fibres undergo atrophy, thus becoming weakened, from inordinate pressure.

Dilatation often supervenes, and it is quite probable that the symptoms, when present, are dependent upon, and date from the time of, its occurrence. Rupture of the organ is also not unlikely. A coronary artery and the aortic arch are often arteriosclerotic. In the cachexias of carcinoma and phthisis, the general atrophy of the aged, fatty infiltration and fatty degeneration co-exist.

Case of fatty infiltration of the heart in a woman of 40, weighing 220 pounds, who had been asthmatic and suffered from delirium cordis, and, from time to time, anginoid attacks. Similar case in a woman of 50, who weighed 310 pounds,

in whom there was, besides, extreme dyspnoea, cyanosis, and exhaustion on exertion. In the latter appropriate treatment reduced the weight 125 pounds, and the patient recovered. Fatty infiltration of the pericardium probably existed in this and other cases reported in which reduction of weight caused very marked improvement. Anders (Amer. Jour. Med. Sci., Apr., 1901).

The nutrition of the body and the maintenance of it at a given weight are regulated by a nervous mechanism, in the same way that the heat of the body is controlled. It is essentially a condition of altered metamorphosis closely allied to gout, diabetes, chlorosis, myxoedema, and arrests of development. Habitually more food is taken than is needed to maintain the nutrition of the tissues and in the ordinary oxidation for the production of energy. The remaining food is oxidized and gotten rid of under the regulating influences of the nervous system. Debove (La Semaine Méd., Mar. 13, 1901).

Fatty degeneration of the heart divided into three stages: The first stage is that one in which the prognosis is most favorable; that is, if the patient does not yield to the primary disease he will probably recover with a sound heart if properly treated. In the second stage prognosis is not good for total arrest of the fatty process, but much improvement may be brought about. The third stage is marked by profound implication of the internal viscera, the prognosis is unfavorable, and the end may be expected within a few months. Fatty degeneration of the heart is a common affection; it is not to be classed as a disease *sui generis*, but as a process attending non-valvular as well as valvular affections. It is caused by fevers, toxæmias, dyscrasias, disorders of nutrition, and mechanical injuries, but it may be a physiological process, as in senility or after parturition. T. E. Satterthwaite (Medical News, Feb. 2, 1901).

Under the head of fatty heart there are at least two different conditions: There is the small heart, free from accumulation of fatty tissue upon its ex-

terior, which is degenerate throughout,—to such an extent, indeed, that the apex of the ventricle may consist of nothing but fat. There is, again, the large, heavy, thick heart, which is overlaid with fat deposited beneath the pericardium, which fills up both the transverse and longitudinal sulci, and which penetrates between the muscle-fibres of the organ, finally involving the fibres themselves. H. Hirsch (Wiener med. Wochen., March 22, 1902).

Prognosis.—Cases in which fatty degeneration has not as yet been set up afford a favorable prognosis, especially if the cause be removable. On the other hand, in long-standing cases of excessive obesity, more or less fatty change of the muscle-fibre may be safely inferred to exist, and the outlook is dubious, though much will depend upon the special cause and its degree of removability, as well as the presence or absence of serious complications. Among the latter, the more important are arteriosclerosis, albuminuria, glycosuria, anginal attacks, pulmonary congestion, oedema, and the like. Permanent results are not always attainable in cases dependent upon the patients' habits, since the latter are liable to relapse into them after a variable degree of improvement.

Treatment.—**PROPHYLAXIS.**—Although such cases generally first come under observation too late to receive the benefits of prophylactic measures, there are, nevertheless, many favorable opportunities presented to the wise family physician to attend to this important matter, even in the earlier years of those showing an hereditary predisposition to obesity. The fat-forming foods, particularly the carbohydrates, must be greatly restricted in the dietary. The amount of drink must also be diminished, as a rule. Fats and proteids are allowable, and their proportions must be regulated according to the amount of muscular ac-

tivity. Systematic exercise, in the fresh, open air, along with cool baths, are measures to be adopted. Persons in middle life who manifest a predisposition to corpulency should be cautioned against all imprudences in eating and drinking; they should pursue a prescribed dietary, in which not only the character, but the quantities of the various substances allowed should be noted. If there be the slightest tendency toward anæmia, an open-air existence, short of injurious exposure, is imperative. Gymnastics and out-door sports, if wisely regulated, should play a part in the prophylactic management of these cases. If anæmia be associated with fatty overgrowth, then greater care and caution must be exercised in recommending physical exercise, the amount of liquid may be much diminished, and the fat-forming dishes should be rigidly excluded. I have long been prescribing arsenic, strychnine, and iron, in small doses, in such cases.

In the treatment of fatty overgrowth, the system introduced by Oertel, as I have observed personally, promises excellent results if faithfully employed. Among contra-indications that should be heeded are marked atheroma and chronic valvular disease of the heart, particularly in cases that have passed into the stage of broken compensation. The method will be briefly described, and comprises three parts: 1. The reduction of the amount of liquid taken with the meals and during the intervals, the total for each day being 36 ounces (1064.0). Additionally, frequent bathing, and in suitable cases the Turkish bath and pilocarpine are employed to induce free diaphoresis. 2. The diet is composed largely of proteids, as follows:—

Morning.—A cup of coffee or tea, with a little milk—about 6 ounces (178.0) altogether; bread, 3 ounces (93.0).

Noon.—Three to 4 ounces (90.0 to 120.0) of soup; 7 to 8 ounces (218.0 to 248.0) of roast beef, veal, game, or poultry, salad or a light vegetable, a little fish; 1 ounce (32.0) of bread or farinaceous pudding; 3 to 6 ounces (93.0 to 186.0) of fruit for dessert. No liquids at this meal, as a rule, but in hot weather 6 ounces (178.0) of light wine may be taken.

Afternoon.—Six ounces (178.0) of coffee or tea, with as much water. An ounce of bread as an indulgence.

Evening.—One or two soft-boiled eggs, 1 ounce (32.0) of bread, perhaps a small slice of cheese, salad, and fruit; 6 to 8 ounces (178.0 to 236.0) of wine, with 4 or 5 ounces (120.0 to 148.0) of water (Yeo).

3. Graduated exercise up slight elevations and inclines, the distance to be undertaken each day being carefully specified, beginning with slight efforts and frequently, though gradually, increasing them. A similar plan is to be pursued with reference to the degree of inclination, and it is to be recollected that this is the most important part of the Oertel system, since it directly and methodically invigorates the heart-muscles.

The all-important element of the treatment of obesity is that which has reference to overcoming the causal obesity. Here the *diet* should receive first consideration. From this the stimulation of the bodily forces that oxidize and destroy the fat cannot be disassociated. These two measures in combination, if properly employed in individual cases, will serve to bring about a diminution in the body-bulk, and tend to invigorate rather than weaken the patient. They may be briefly discussed in sequence for the sake of convenience.

(a) THE DIETETIC TREATMENT.—The ingestion of substances that are fat-form-

ing must be restricted. The principal systems of dietary are those known by the names of Banting, Ebstein, and Oertel. In all of them the total amount of food is greatly diminished as long as there is an increase in the body-weight or a persistence of the sensations of discomfort.

In "Bantingism" sugars, fats, and starches are greatly reduced in the diet-list; water, however, is not restricted, and vinous and spirituous liquors are rather freely permitted. In those of a lithæmic, rheumatic, or gouty diathesis (often associated with obesity) Banting's heavy proteid and alcohol dietary is not to be recommended. It is best, I think, to exclude alcohol in most cases, owing to its effect in diminishing tissue-oxidation and in retarding cell-metabolism.

In Ebstein's diet-list more than double the amount of fat and carbohydrates is permitted as compared with Banting's list, while the albuminous substances are diminished. Fat is freely allowed, while sugar and potatoes only are strictly forbidden. Oertel also allows more fat than Banting, but less fat and more (about double the quantity) proteids and carbohydrates than Ebstein. In addition to the 1 pint of water allowed in food, he permits 1 pint of free water daily. Oertel's special diet-list in fatty infiltration, as given above, is based upon these facts.

Oertel's treatment of corpulence abandoned because the patients suffered greatly from thirst and hunger, and were disturbed in their general health; many of the patients so treated became severely neurasthenic and sleepless; the loss of fat was, in most cases, considerable for some weeks, but after that it seldom bore any relationship to the trouble and suffering caused by the dietary.

The following program has been found much more satisfactory:—

6.30 A.M.—Cold sponge; walking or other exercise for half to three-fourths

of an hour. 7.30 A.M.—Breakfast: tea or coffee with cream; one slice brown bread thickly spread with butter. 8.15.—Vapor-bath every second day, alternated with cold bath. 9.30—One egg or a slice of fat bacon. 10-12.30.—Exercise. 12.30 —Lunch: bouillon and egg; fat meat with salad, an apple, some brown bread, mineral water, and one thyroid tablet. 1.30 P.M.—Rest, and then a cup of tea or coffee. 3.15-6.15.—Exercise. 6.30.—Cold douche. 7.—Dinner of proteid food and green vegetables chiefly; one thyroid tablet. Billiards or skittles may fill up the evening.

Thyroid preparations must be used with great caution, as they promote wasting of muscle as well as of fat. A small dose is given, and its effect on the pulse watched, as patients react strongly in some cases, and scarcely at all in others. Its use greatly hastens the loss of weight, but it should not be continued if it produces any other effects. V. Hoesslin (Edinburgh Med. Jour., Nov., '99).

Obesity treated by a diet unmodified by cooking or preserving, such as raw milk, eggs, meat, salads, and fruits. Case of a man reported, whose weight after less than a year of treatment was reduced from 325 to 204 pounds. G. M. Debove (Bull de l'Acad. de Méd., Mar. 6, 1900).

The following dietary may be ordered in selected cases:—

Morning Meal.—Fine wheat-bread, 1 $\frac{1}{4}$ ounces (40.0); a soft-boiled egg; milk, 1 ounce (32.0); sugar, 77 grains (4.9); coffee, 4 $\frac{1}{4}$ ounces (136.0).

Noon Meal.—Soup, 3 ounces (96.0); fish, 3 ounces (96.0); roast or boiled beef, veal, game, or poultry, 6 to 8 ounces (192.0 to 256.0); green vegetables, 1 $\frac{1}{2}$ ounces (48.0); bread, 1 ounce (32.0); fruit, 3 or 4 ounces (96.0 to 128.0); no liquid (or only 4 or 5 ounces —120.0 to 148 cubic centimetres—of very light wine).

Afternoon Meal.—Sugar, 77 grains (4.9); coffee, 4 ounces (128.0); milk, 1

ounce (32.0); occasionally bread, 1 ounce (32.0).

Evening Meal.—Caviare, $\frac{1}{8}$ ounce (10.6); one or two soft-boiled eggs; beef-steak, fowl, or game, 5 ounces (160.0); salad, 1 ounce (32.0); cheese, 1 drachm (4.0); bread, rye or bran, $\frac{1}{2}$ ounce (16.0); fruit or water, 4 to 5 ounces (120.0 to 148.0).

For the treatment of obesity, diet: five meals during the day. For breakfast, a raw egg at 8 o'clock, $\frac{1}{8}$ ounce of lean meat or lean fish, the whole eaten cold and dry—this condition is emphasized, that the patient must eat his meat cold; cold meat may be consumed in greater quantity than hot meat without causing increase of weight; $\frac{1}{8}$ ounce of bread; 1 cup of hot tea without sugar. At 10 o'clock, 2 raw eggs, $\frac{1}{8}$ ounce of bread, 5 ounces of wine and water, or tea without sugar allowed. At noon, cold lean meat *ad libitum*, but no bread; a little water-cress or salad salted and flavored with lemon-juice; of raw fruits 3 to 5 ounces for dessert, and for drink, may be taken, with this meal, 1 or 2 tumblersful of water, or water simply reddened with a little wine. One-fourth hour after dinner a cup of weak tea not sweetened and at 4 P.M. a cup of weak tea not sweetened, and nothing else allowed. At 7 P.M. the same repast may be taken as in the morning at 8 o'clock, and a little more lean fish or meat may be added, which the patient may eat warm; the whole quantity must not exceed $3\frac{1}{8}$ ounces.

Exercise in the open air is insisted on; this may consist of a walk of half or three-fourths of an hour after each meal; that is, five times a day. The time spent in this exercise should be gradually increased from half an hour to three-fourths of an hour of brisk walking after each meal, and all the influence of the physician should be exerted to enforce this regulation. If the patient be a woman, a carriage-ride, with a walk in the country, may be the utmost that can be exacted.

Hydrotherapy followed by frictions, in a word, everything which stimulates the

functions of the skin—vapor-baths, massage, etc.—may be enjoined.

Sleep during the day-time should be absolutely interdicted. The patient should go to bed at 11 o'clock P.M. and rise at 6 A.M. during the summer, and at 7 A.M. during the winter—not more than seven hours of sleep for the adult and eight hours for the child.

It is possible to obtain sufficiently good effects from regimen without having recourse to any kind of medicine. A. Robin (Bull. Gén. de Thé., Oct. 30, '97).

Too rigidly uniform measures in the treatment of obesity deprecated. Principal indications discussed under seven heads: 1. All dietetic excess should be avoided; three, or at the outside four, meals a day should be permitted and no food allowed in the intervals. The quantity and variety taken should be based upon the heat-giving properties of the food-substance. 2. The first essential is an adequate supply of proteids; a moderate amount of carbohydrate may be allowed, but the fat must be reduced to a minimum. Piquant seasonings are to be avoided. 3. The consumption of fluid is not to be limited unless symptoms of cardiac failure are present; such liquids as are fancied, with the exception of alcohols, may be taken at any time, but moderation is to be observed at meals. Cold water, especially if charged with carbonic acid, is to be preferred. 4. Exercise and active movements in the treatment of plethoric obesity insisted upon, the state of the heart being always taken into consideration; they are of particular value in increasing the activity of oxidation processes. In anæmic subjects, however, these advantages are counterbalanced by the increased nitrogenous waste, which may injuriously affect the heart. In these patients passive movements and massage are accordingly to be recommended. 5. Great importance is attributed to diminution in the hours of sleep; sleep should be entirely forbidden during the day. 6. Tissue-change is also to be increased by baths, particularly in springs rich in carbon dioxide. Turkish baths are also of value if the heart is sound.

7. Important to secure pure air, rich in ozone, especially in a high and wooded neighborhood. Kisch (Wiener med. Presse, Mar. 13, '98).

As the cause of the condition either in severe or slight form consists in taking in more fat-making food than the body can burn off, the treatment consists in limiting food, both in quantity and in quality, and in increasing the combustion by accelerating the circulation. Active muscular exercise is the best means of carrying out the latter point, but in severe cases the patients cannot take muscular exercise. In these massage is exceedingly valuable, but is alone not sufficient and must precede rather than supplant active exercise. The amount of food should be lessened in general by insisting that solids and liquids should be taken at different times. Many are apt to wash down food, especially farinaceous food, without much chewing. If this starchy food were made dry,—like toast, rusk, and biscuit,—the quantity taken without the aid of fluid would be much less. Digestion in the stomach has less tendency to form fat than when the digestive process is carried on in the intestine. This gives a good index of the kind of food most suited to these patients. It is necessary to secure active elimination of the products of combustion. Thyroid extract increases tissue-change and may be used to decrease obesity. But diet and exercise are safer and in the long run more reliable. T. Lauder Brunton (Medical News, March 22, 1902).

Excellent results obtained by the writer in the treatment of two cases of obesity by a reduced milk diet. The treatment consisted simply in directing the patients to take nothing but milk, drinking as little as possible. In five weeks one patient lost 21 pounds, and a second 16 pounds. In fifteen years which have elapsed the writer has treated about 30 cases of obesity with this method, with results highly satisfactory. The measures taken are simple, economical, and efficient. Some of his patients have given up after a few days, but others persisted until the desired results were obtained. Commonly

the amount of milk ingested each day is $\frac{1}{2}$ litres, taken in small quantities, ordinarily unboiled and cold, with the exception of the morning, when the milk may be taken hot but without bread. The milk diet is ordinarily continued from four to nine weeks, after which the midday meal is taken, but the milk is continued in place of supper. Le Menant (Jour. de Med., Feb. 1, 1903).

(b) The physical exercise (mechanical treatment) already mentioned is to be combined with the dietetic treatment.

If increase of muscular activity is pushed to a degree, the temperature of the body is raised, anemia results, and there is a reduced capability of exertion. This may be avoided by artificially cooling the body before the muscles are called into play. If a patient is treated for several days with cold sponge-baths, followed by steam-baths, the skin is soon brought into such a condition that this increase of temperature is avoided. Profuse excretion of sweat also assists in reducing the fat. After the steam-bath the patient takes a bath in a tub, and then the prescribed walk. Later, massage is utilized. This series of manipulations may be repeated twice, or, in some cases, three times daily. After the steam-bath, some patients are at once put into a cold tub-bath. By this treatment within a few weeks can be brought about a loss in weight of forty-five pounds without weakening the patient and without altering the diet to any great extent. Winternitz (Med. News, Jan. 29, '98).

Restricted diet recommended, but one that is highly nutritious, thus not depending upon it for any marked reduction in weight. Gymnastic exercises with resistance recommended for all forms of fatty heart, since the resistance may be regulated to suit the weakest or the strongest heart. Rest should never be indulged in after eating. Massage proves efficient in promoting absorption of fat. The balneological treatment is very important. The baths usually get down to 76° F., and are increased in length up to twenty minutes. Gradually increased concentrations of salt are

used in the baths. T. Schott (Med. Record, Mar. 24, 1900).

It is especially in cases in which the subjective distress (dyspnoea, palpitation) is dependent upon cardiac dilatation due to fatty overgrowth that Oertel's system of graduated walking or climbing along "health-paths" is to be energetically recommended. The mechanical treatment is to be advised with extreme caution in cases presenting atheromatous vessels.

The well-known Nauheim or Schott treatment may sometimes be employed: but it is not to be thought of if there be present any of the more characteristic evidences of fatty degeneration of the heart. The medicinal treatment of obesity is far from satisfactory.

The use of thyroid extract is coming into favor with the majority of the profession, while being condemned by a minority. If judiciously employed, it offers good results in many cases. Leichtenstern, Wendelstadt, Ewald, and others have reported success in a number of instances, especially in those exhibiting the anæmic, flabby, "myxœdematoid" variety of polysarcia. The loss of weight was two to three pounds in one week, and as high as twenty pounds in two to four weeks. In a number of my own cases belonging to this type of obesity the use of thyroid extract (desiccated) in small doses caused a progressive loss of weight ranging from two to six pounds per week, respectively, without impairment of the general health. The effect of this agent upon the circulation, particularly the cardiac action, must be carefully noted, and in some instances it is necessary to protect the organ against its disturbing influence by the use of stimulants and tonics (strychnine, digitalis).

Thyroid extract constitutes a means of rapidly reducing weight without causing any special disturbance in the patient's general condition or any limitation of his activities. The extract should be given in doses of 3 grains two or three times a day after meals, and gradually increased to 7½ grains. This treatment is continued for months, with occasional intermissions. The benefit proves most lasting in cases in which decrease in weight is slow. M. Affanasieff (Klinisch-therap. Wochen., Feb. 6, '98).

Patient ordered thyroid extract for obesity. Within five weeks he took nearly 1000 tablets, each containing 5 grains. For the first three weeks nothing was noticed, except loss of flesh, but after this time dyspnoea came on, with swelling of the neck and very rapid loss of weight. Altogether, thirty pounds were lost, and five-sixths of this loss took place in the last three weeks. When examined, the patient had marked exophthalmos, with both Stellwag's and von Graefe's signs; the thyroid gland was enlarged and pulsated, and there was a thrill over it; there was a fine tremor of the fingers and tongue; the cardiac apex-beat was displaced outward, and the pulse was 120 to the minute; there was cough and severe mental depression; polyuria and glycosuria also were present. Under the use of Fowler's solution and after the withdrawal of the thyroid extract most of the symptoms rapidly disappeared, only the ocular manifestations and the goitre persisting for nearly six months. A. F. von Nothhaft (Centralb. f. innere Med., Apr. 16, '98).

[The administration of thyroid extract should be attended by especial care, particularly at first. The chief editor has witnessed cases in which 2 grains three times a day caused vertigo and fainting-spells.]

Thyroidin, the active principle of the thyroid gland, gives results that are, perhaps, as good as thyroid feeding (Bau mann and Ross).

Patient successfully treated with thyroidin for a fatty heart. When gland

of the ox was tried, patient began to make flesh rapidly. This sustains the opinion that the thymus and thyroid glands of the sheep are the most active. Schlesinger (Med. Press and Circular, Mar. 25, '96).

[Jerzykowski treated ten cases of corpulence by thyroïdin in doses of from 5 to 8 grains *per diem*. In one case more than forty pounds were lost in two months, and in another thirty pounds in three months. J. M. ANDERS.]

The symptoms of thyroidism (tachycardia, vomiting, renal pain, suffusion of the face, syncope, vertigo, and marked headache) are a signal for a discontinuance of the remedy. The treatment may be resumed again, cautiously, alternating with intervals of cessation. (See ANIMAL EXTRACTS, volume i.)

Fatty Degeneration of the Heart.

Symptoms.—The condition may exist in an advanced form without the production of symptoms (latent fat-heart). The presence of any causal conditions, however, should be noted, and they afford premises for suspicions, although even when symptoms during life point strongly to the existence of fatty heart it may not be revealed by an autopsy. The characteristic evidence of defective heart-power are generally present, but in pernicious anæmia, chlorosis, and in certain wasting affections, the fatty change may be marked and the pulse continuing full and regular while the patient is at rest. In such cases, slight provocation or strong excitement lead to palpitation, leaving signs of commencing dilatation (an apical systolic murmur, with feeble, diffuse impulse). The condition is quite commonly associated with hypertrophy and chronic nephritis; it then gives rise to the phenomena that characterize failing compensation. The process is constantly associated with sclerosis of the coronaries, a clinical type which embraces most of the cases of so-

called idiopathic fatty heart of the English writers. I have frequently observed that these cases manifest the same grouping of symptoms as met with in premature senility.

Dilatation is apt to supervene early in fatty degeneration of the heart, owing to the weakened state of the cardiac walls; hence it is quite probable that many of the symptoms that have been ascribed to the morbid processes are, in reality, due to secondary dilatation. It is to be remembered that the symptoms pointing clearly to defective heart-power may be in evidence only after great exertion. Among the symptoms pointing to over-distension, either constant or temporary, of the cardiac chambers, are palpitation, dyspnoea, and a small, irregular, somewhat quickened pulse, and cool and clammy extremities. Great physical exertion may produce sudden, marked dilatation, whereupon a canter-rhythm and an apical systolic murmur speedily develop, although in most instances the symptoms are brought to light in a more gradual manner.

Breathlessness on exertion, even though slight, and syncopal attacks are sometimes troublesome. There may be frequent attacks of cardiac asthma in the morning, and these may be accompanied at intervals with pains, anginoid in character and assuming the severity of pectoris even. The latter complication may, however, occur independently of the asthmatic seizures. The pulse, in consequence of the irritation of the inhibitory centre in the medulla, frequently becomes much retarded, declining from the normal rate to thirty or forty beats per minute, and in rare cases from ten to twelve beats. Disturbances of the intellect, at times assuming the form of manic delusions, may come on and persist for weeks and even months. The fatty

arcus senilis possesses no diagnostic value. Two symptoms of considerable value, particularly when combined in the same case, are pseudo-apoplectic attacks, due to disturbance of the cerebral circulation, and Cheyne-Stokes respiration, the latter being among the later manifestations. When Cheyne-Stokes breathing is in association with pseudo-apoplectic seizures, they are more apt to be due to a uræmic toxæmia perhaps than to fatty degeneration of the heart. According to Broadbent, a noteworthy point is that well-marked dropsy is rare, and probably never occurs in uncomplicated degeneration. The significance of this is that the special effect of the disease is defective pressure in the venous system, and it is to this that the syncopal, apoplectic, and epileptiform attacks are due, which, together with angina pectoris, are the most characteristic later effects of fatty degeneration. The syncopal attacks vary greatly in intensity, and are marked rather by duration than intensity, and are not attended with complete loss of consciousness. He also speaks of attacks resembling petit mal, attended with slow pulse, sometimes less than twenty in the minute.

As to physical signs, there is a weak, irregular impulse that often can neither be seen nor felt; later dilatation supervenes. After the latter event the impulse is apt to be diffuse. The most constant and significant feature of the pulse is that it is short and unsustained (Broadbent). The area of cardiac dullness increases, and a soft systolic murmur is often audible at the apex (relative insufficiency). When fatty degeneration is associated with marked obesity, it is difficult to delimit the area of dullness, for obvious reasons, and the cardiac sounds on auscultation are apt to be weak, distant, and muffled. On the other

hand, in thin subjects and in the fatty degeneration of grave anæmias, the first sound of the heart is often short, sharp (flapping in character), simulating the second sound.

Diagnosis.—It is to be emphasized that in a large number of cases the patient has not consulted his physician when sudden death supervenes from rupture, usually during active exertion or excitement; less frequently the termination in death follows the administration of an anæsthetic or a full meal. Rarely, death follows the action of the exciting cause after the lapse of several hours.

[In a large proportion of the cases there has been no ailment which has led the patient to consult a physician when he is overtaken by sudden death during exertion or excitement, or the administration of chloroform, or after a full meal; or the exertion or excitement may be passed through safely, and death follow some hours later, or even next day. Rupture of the heart is one mode of termination, and this may take place on very slight provocation. When the course of the disease has been sufficiently chronic to permit of the recognition of symptoms (which is chiefly when the degeneration is secondary to changes in the coronary arteries or to old-standing hypertrophy, with or without dilatation), they will be such as are produced by a slackening circulation, and they are not so different from those attending dilatation as to permit of any distinction being drawn between the two conditions in an early stage without physical examination. In advanced stages characteristic differences appear. Marked dropsy is rare. The special effect of the disease is defective pressure in the venous system, and it is to this that the syncopal, apoplectic, and epileptiform attacks are due, which, together with angina pectoris, are the most characteristic later effects of fatty degeneration.

The pulse is short and unsustained. The rate may be regular or extremely irregular, and it may be frequent or

slow. The physical signs are largely negative. If the fatty change is at all advanced, the impulse can be neither seen nor felt. The sounds are weak, and sometimes almost inaudible. WHITTIER, VICKERY, and GREENE, Assoc. Eds., Annual, '92.]

I believe that while fatty degeneration may be a sequel of coronary disease, sudden death in the latter is in the majority of instances to be ascribed to changes in the arterial coats and not fatty degeneration of the heart-walls, with ensuing rupture. Corroborative post-mortem evidence is not wanting. Key Aberg found extensive areas of fatty degeneration only in two instances out of thirteen autopsies of sudden death from cardiac paralysis, brought about by sclerosis of the coronary arteries.

Case in which death occurred amid the symptoms of fatty heart followed by angina pectoris. The post-mortem findings showed the immediate cause of death to have been fatty degeneration of the heart. This did not appear to be dependent on atheroma or occlusion of the coronaries, which seemed everywhere sound and competent, though imbedded in an abnormal amount of fat. In places, as in the wall of the left ventricle below the auriculo-ventricular furrow at the apex, the muscular tissue was entirely replaced by adipose. Primary fatty degeneration of the heart found apart from valvular lesions or marked atheromatous change in the arteries in a young or middle-aged person with no known hereditary predisposition or diathesis is strongly suggestive of chronic alcoholism. In fact, it is regarded by some authorities as almost peculiar to this form of poisoning. E. P. Hurd (Boston Med. and Surg. Jour., vol. ii, '93).

The history, particularly if this points to the existence of arteriosclerosis, the age of the patient, and the symptoms of cardiac insufficiency coupled with retardation of the pulse (though the latter may be increased in frequency), apoplec-

tic attacks, the Cheyne-Stokes respiration, in the absence of antecedent hypertrophy, may be regarded as significant features. Again, with a clear history of the presence of the more characteristic symptoms, including the signs of dilatation following hypertrophy, fatty degeneration may be inferred with some degree of assurance, and yet even this state of affairs should not lead to a positive statement of opinion.

In persons having reached middle life, in whom a weak and irregular action of the heart is manifested, it becomes an important question to decide whether this be due to functional disturbances or organic disease. Broadbent states that usually this is accomplished by making the patient walk briskly. A few steps will often be sufficient. If the heart is sound it rises to the occasion. The pulse and beat sounds are all more distinct, and strong and regular, whereas the fatty heart "goes to pieces," and the pulse becomes irregular and shorter than ever or may even disappear.

Fatty degeneration may follow fatty infiltration of the heart, and while in consequence of this fact the two conditions are sometimes found in association, they are to be looked upon as separate and distinct morbid processes. In attempting to discriminate one from the other a recognition of the differences in causation is all-important. Fatty overgrowth is due to, and associated with, polysarcia, while the leading causal factor of fatty degeneration of the heart is arteriosclerosis affecting the coronaries, or atheromatous changes in the valves or walls of the aorta, causing obstruction at the mouths of the coronaries: conditions that would lead to weakness of the cardiac walls due to degenerative change. Among favoring causes of fatty degeneration are to be reckoned all the various

factors that tend to bring about arteriosclerosis, as syphilis, diabetes, and alcoholic excess, though the latter may also act primarily upon the myocardium or the blood itself. Cases of fatty heart occur independently of coronary disease (*vide supra*). Thus, the disease co-exists with pernicious anæmia, chronic alcoholism, and not infrequently follows acute forms of disease, as acute aortitis and typhoid fever. In typical arsenical and phosphorus poisoning the fatty heart is constantly encountered.

The symptomatology of these two cardiac affections present differences of considerable significance. Both may exist, however, without the production of symptoms, and both have symptoms in common, such, for example, as dyspnoea upon exertion, and arrhythmia, including reduplication. In fatty degeneration the volume of the pulse is diminished to a greater extent, and the disturbance of the rhythm of the pulse is also greater than in fatty infiltration. The breathlessness of fatty infiltration after exertion is associated with obesity; not so in fatty degeneration, as a rule.

The occurrence of "syncopal, apoplectic, and epileptiform attacks" in connection with the factors of etiological importance mentioned above, point strongly to fat-degeneration, and these symptoms are attributable to insufficient pressure in the arterial tree. Mild syncopal attacks may arise in fatty overgrowth, but when they become more severe, more frequent and prolonged, and particularly with associated coldness and clamminess of the extremities and body-surface, then fatty degeneration should be suspected. Much the same remarks apply to the symptom angina. The symptoms of bronchitis and asthma, either separately or combined, are oftener met in fatty overgrowth. In the

latter condition the heart-sounds are weak and distant or muffled, owing to abnormal fat-deposits; in fatty degeneration, the sounds are short, flapping in character, due to associated dilatation, but they are clear, and an apical systolic murmur is not uncommonly audible. The so-called therapeutic test is an aid in the discrimination. Thus, as the result of appropriate treatment for the obesity the abnormal deposits of fat in and around the heart can be made to gradually disappear, with marked or even complete relief from the inconveniences occasioned thereby. On the other hand, slight temporary improvement, if any, is all that can be hoped for in advanced fatty degeneration, or at a time when the diagnosis is reasonably assured. Finally, it may be said that the recognition of fatty infiltration is an easy matter, while that of fatty degeneration is scarce feasible until a late stage is reached. That form of fatty degeneration which follows compensatory hypertrophy is distinguished from fatty overgrowth by the special history, absence of obesity, and obviously dissimilar physical signs. It is to be recollected that dilatation following hypertrophy is not invariably due to fatty change.

The term "fatty degeneration" should be limited to that condition in which an organ contains more fatty tissue than is normally present. This must be determined by chemical or microscopical methods. The latter, however, seems inadequate in most instances to afford any reliable quantitative estimate of the fat present in any given organ. Of the chemical methods, that which is based on the extraction by alcohol or chloroform seems most efficient. The author attempted to ascertain by experiments in animals which organs are the most liable to undergo a fatty degeneration. These were given phosphorus, phloridzin, chloroform, alcohol, and various other materials. The liver was apparently the

most quickly affected. As regards the heart, chloroform and cantharides had no effect, alcohol and potassium bichromate caused an increase of about 2 per cent., phosphorus and phloridzin about 4 per cent., and extirpation of the pancreas was followed by an increase of 6 per cent. It seems, therefore, that there is no connection between the two in cases in which a patient dies from poisoning by chloroform and a fatty heart is found at autopsy. In the kidney a marked increase in the amount of fat present is produced by cantharides and chloroform. Very little change follows the administration of either phosphorus or potassium bichromate or extirpation of the pancreas, but a rather marked increase in the amount of fat is produced by alcohol. Muscular tissue, as a general thing, afforded the surprising picture of a diminution of the fatty elements rather than an increase. The author concludes from his observations that in those organs where fatty degeneration is present the fat arrives there by a process of migration. Rosenfeld (Ber. klin. Wochen., June 9, 1904).

Etiology.—Both in secondary and primary forms of hypertrophy, as well as in chronic myocarditis and chronic pericarditis, fatty degeneration may supervene. The degeneration of the cardiac walls dependent upon valvular disease, Bright's disease, and general arteriosclerosis is, perhaps, more often fibroid than fatty in nature.

Valvular lesions produced artificially in dogs, cardiac hypertrophy ensuing. The compensation could only be broken by disturbing the innervation (*e.g.*, by section of the vagus nerve). Fatty degeneration of the heart of itself is not capable of producing loss of compensation. Phosphorus was administered to dogs with valve-lesions, and although at necropsy the heart was found quite fatty, compensation had been undisturbed. The writer maintains, therefore, that it is chiefly through disturbances of the nervous mechanism of the heart that failing compensation is brought about. R. Bulint (Deut. med. Woch., Jan. 6-13, '98).

It is constantly met, also, in association with fatty change in other organs, in the severe forms of primary and secondary anæmias, and even more commonly, though of a less severe grade, in the cachectic states produced by such chronic diseases as carcinoma and phthisis.

The condition may arise in the course of acute infectious diseases of intense type, especially diphtheria and typhoid fever.

Fatty degeneration is extremely common in diphtheria, fatty degeneration appearing in 14 out of 19 animals (guinea-pigs, rabbits, kittens) inoculated with the bacillus diphtheriæ or its products. It appears to depend more on the intensity of the poison than on the time of its action. Simon Flexner (Johns Hopkins Hosp. Bull., Mar., '94).

Certain toxic agents (arsenic, phosphorus, alcohol) are potent to cause a high grade of fatty degeneration. In the case of alcohol, it is only after long periods of intemperance that cardiac degeneration is established, and often only after primary coronary sclerosis. Besides sclerosis, which is an all-important etiological factor, the condition may be consequent upon a mere blocking of the mouths of these vessels.

Fatty degeneration is most common after forty years of age.

It occurs somewhat more frequently in men than in women, notwithstanding the fact that there are predisposing influences at work in the latter that do not obtain in the male sex, such as childbirth and amenorrhœa. Whatever may be its apparent etiology, it is invariably preceded by a defective nutritive supply to the muscle-cells; this may be dependent on mechanical causes, such as narrowing of the lumen of the coronary vessels, or upon impairment of the oxygen-carrying power of the blood, as in the anæmias.

[An important point in fatty degeneration is that the primary change is atrophy of the muscle-substance, and the fatty degeneration is secondary to this and consequent upon it. Disease of the coronary arteries being thus a cause of degeneration of the heart, the existence of conditions which may lead to the implication of the coronary arteries or their orifices in morbid processes will warrant a suspicion that cardiac weakness, which may be recognized, is the result of degeneration. But there may be fatty degeneration of the heart when the coronary arteries are healthy. It is usually present, sometimes in a very advanced degree, in pernicious anæmia, and granular degeneration, which is an acute form of the disease, is a constant effect of severe typhoid fever and of fatal phosphorus poisoning. Diabetes, alcoholic excess, and a sedentary mode of life may conduce to fatty degeneration of the heart, probably through deterioration of the blood, or it may be secondary to myocarditis. WHITTIER, VICKERY, and GREENE, Assoc. Eds., Annual, '92.]

Pathology.—The process may be either general or localized. Thus, when circumscribed it may be limited to the uppermost or subpericardial layers, as when induced by pericarditis. The same minute foci and yellowish striæ may be observed in the superficial subendocardial layers, especially in the trabeculæ of the papillary muscles ("tabby-cat" striation). Blocking of one of the branches of the coronary artery (as a rule, the anterior) by a thrombus or embolus leads to the production of an anæmic necrosis or white infarct, which is often composed of fatty *débris*.

In general fat-degeneration the muscular substance throughout presents a pale- or a light- yellowish appearance, and is quite friable, the finger being readily thrust into it. Rarely, the color-tint is brownish in circumscribed areas from associated brown atrophy.

The various chambers of the heart are often enormously dilated with marked overstretching of the intracardial orifices. Coronary-artery diseases and atheroma of the arch of the aorta are among the most constant associated lesions.

In fatty degeneration the sarcous substance of the fasciculi is directly converted into globular fat, as contrasted with the condition of fatty infiltration, where the fat is deposited between the fasciculi.

There is only one condition—namely, phosphorus poisoning—in which fatty degeneration of the heart can be said to occur with sufficient regularity or in sufficient amount as to be of significance. Krehl (Deut. Archiv f. klin. Med., B. 51, S. 417).

The occurrence of fatty degeneration of the myocardium in certain diseases in human beings is even at this time questioned by some authors. Notwithstanding the recent study and criticism of Krehl, it must be admitted that there are disease processes in human beings in which it is often present, and that in one class of affections—namely, chronic heart disease with hypertrophy and dilatation of the organ—there can be no doubt of the common occurrence of fatty degeneration. The endeavor to make a fatty metamorphosis of the proteid constituents and cells dependent on the diminution of the oxygen supplied to them has not met with success. In the anæmias which occur in human beings, and can be produced experimentally upon animals, fatty changes are often absent or occur in only inconsiderable degree; and the effect of fever alone is all but established to have a relatively slight importance in bringing about such changes as act injuriously upon the heart's function. Therefore it seems unavoidable to connect with the occurrence of fatty degeneration in its severer forms in the infectious diseases of man and animals a disturbance of cell-metabolism more nearly like that which phosphorus intoxication induces. The re-

searches of Voit, Bauer, and others have shown that the fatty change is produced out of the proteid constituents and the cells. Flexner (Johns Hopkins Hosp. Bull., Mar., '94).

Microscopically, the cell-fibres are observed to be displaced by minute granules and oil-globules, the latter first making their appearance at the poles of the muscle-nuclei; the striæ and nuclei become indistinct, and finally are wholly lost. The characteristic brown granules of brown atrophy may sometimes be visible, either at the extremities of the nuclei or uniformly distributed. The microscopical appearance of fattily-degenerated muscular tissue is sometimes confounded with albuminoid degeneration, but the form may be distinguished by the characteristic brown coloration when stained with osmic acid, and also the fact that on treating a section with acetic acid the fat-globules are not thus affected, while the albuminoid granules are dissolved.

It is questionable whether an ordinary microscopical examination of portions of the heart-muscle suffices for an absolute recognition of fatty degeneration. Chemical examination strongly recommended. Krehl (Deut. Archiv f. klin. Med., B. 51, S. 417).

Prognosis.—This is unfavorable. The increasing liability to sudden death must be steadily borne in mind (Tyson).

Case of rupture of the heart observed occurring during the act of passing a soft-rubber stomach-tube for purposes of lavage in the treatment of a gastritis from which the patient was suffering. The patient was a woman, 60 years of age, and not particularly stout. The tube had just been passed into the stomach, without any excessive retching or straining on the part of the patient, when suddenly a pallor spread over the patient's face and her eyes rolled up. The tube was immediately removed, the patient was placed on her back, and every possible means used to resuscitate her, but she was dead. At autopsy the

heart was found ruptured. Extensive fatty changes of the heart and liver were found. Greig (Canadian Practitioner, p. 81, Feb., '98).

While death often comes quickly, in the majority of instances the end is reached in a gradual manner, the signs and symptoms of advanced dilatation closing the scene. The frequent recurrence of syncopal, pseudo-apoplectic, epileptiform, and anginal attacks herald an early fatal termination. All known remedies are without avail in restoring the integrity of the degenerated muscle-tissue.

Treatment.—The cause in each individual case should be determined with precision if possible, and, if detectable, a bold attempt should be made to remove or moderate it. This course embraces in different cases many hygienic and dietetic considerations that assist in improving the nutrition of the cardiac tissue: one of the cardinal aims of a proper system of treatment.

Anæmia in one form or other often plays an important etiological rôle, and the particular variety present in each case must decide the character of the special remedies to be employed. Thus, pernicious anæmia would call for the exhibition of arsenic in gradually-ascending doses to the limit of gastric tolerance; chlorosis would demand, in addition to an appropriate hygienic regimen, the use of iron (*e.g.*, Bland's pills). In that large category of cases occurring in certain cachexias (cancerous or tuberculous) the following formula has, in my hands, given gratifying results:—

℞ Acidi arsenosi, 1 grain.
Ferri sulph., 30 grains.
Strychninæ sulph., 1 grain.
Quininæ sulph., 1 drachm.
Papoid, 30 grains.

M. et ft. capsulæ No. xxx.

Sig.: One after meal-time.

When the signs of cardiac dilatation become well established, rest, in the recumbent posture, should be strictly enjoined, owing to the danger of a sudden fatal rupture of the heart, and cardiac stimulants should be administered. Digitalis and strophanthus may be selected, but should be given with extreme caution, the commencing dose being small, and increased according to the effect in the individual case. In the form of a powder or an aqueous extract it may be conveniently combined with the prescription appended above.

For sudden heart-failure the diffusible stimulants (ether, ammonia, and alcohol) are to be resorted to. If marked arteriosclerosis be associated, then nitroglycerin and the nitrites are to be employed.

In cases of average severity I believe that gentle indulgence in physical exercise and light gymnastics is beneficial, since it tends to invigorate the heart-muscle; it is to be increased in proportion to the improvement manifested in the patient's condition. Walking up ascents, however slight, is not to be advised for some time after the other, gentler methodic exercise has been commenced. It sometimes happens, however, that even slight exertion is badly borne, and it should then be promptly discontinued. In the latter class of cases I have been in the habit of advising daily inhalations of oxygen-gas, combined with complete rest and recumbency, with excellent results. Recourse to massage is also in the line of sound practice, but the sitting should not exceed half an hour in duration to begin with.

The more prominent symptoms may require special medication. Attacks of syncope are most successfully controlled by the hypodermic use of the diffusible stimulants (ammonia or ether), at the

same time enjoining absolute rest, with the head lowered. For the angina pectoris, the combined use, hypodermically, of morphine (in small doses) and atropine is to be preferred, except in cases in which the apoplecticiform seizures, with a comatose tendency, are of frequent occurrence. Again, when the anginoid paroxysms are dependent upon coronary disease, recourse should be had to nitroglycerin and the nitrites. For the apoplectic attacks rest in the recumbent posture, with the head slightly elevated, is useful. Among therapeutic agents, digitalis, ammonia, and ether may be used hypodermically to stimulate the heart; it is also good practice to withdraw from 12 to 24 ounces of blood directly from a vein.

The life of the sufferer may be prolonged by giving him an abundance of sunshine and fresh air in favorable weather, but exposure to severe cold must be scrupulously avoided.

The *diet* should be simple, easily assimilable, though highly nutritious. I believe it to be an excellent rule to allow small meals at strictly regular, brief intervals. A light wine may be taken at dinner as an aid to digestion and nutrition. The bowels should be made to move rather freely and easily by means of properly-selected articles of food, and, these failing, mild laxatives.

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FEVER, INTERMITTENT. See MALARIAL FEVERS.

FIBRINOUS BRONCHITIS. See BRONCHITIS.

FIBROID PHTHISIS. See TUBERCULOSIS OF LUNGS.

FISTULA, ANAL. See RECTUM AND ANUS.

FORMALDEHYDE.—This gaseous compound, discovered by von Hoffman in 1867, is produced when a current of air charged with vapor of methyl-alcohol (wood-alcohol, or refined wood-spirit) is directed upon an incandescent spiral of platinum wire, or spongy platinum. By means of a suitable condensing apparatus a liquid called formol may be obtained, which consists of a solution of formaldehyde-gas in methyl-alcohol.

A watery solution of the gas is the formalin of commerce, which contains 40 per cent. of formaldehyde.

Formaldehyde is also known as formaldehyde, methyl-aldehyde, and oxymethylene.

Polymeric Modifications.—When formaldehyde is heated or strongly concentrated, it is converted into a white crystalline powder (paraform, or paraformdehyde), which possesses most of the characteristics of formaldehyde, owing to its gradual reversion to the gaseous state.

When paraform is volatilized it reverts to the gaseous form, but is redeposited as a sublimate in the crystalline form (surgical dressings and bandages are impregnated with formaldehyde in this way).

When formalin (watery solution of formaldehyde-gas) is heated in a dish or vessel, formaldehyde is disengaged and, at the same time, paraform crystals are deposited on the interior of the vessel. Paraform, or the polymerized form of formaldehyde, is also known as paraformaldehyde, paraformicaldehyde, triformol, trioxymethylene, and dry formalin, and may be obtained in the form of white, crystalline powder, or molded into pastils.

Physiological Action.—Formaldehyde has an intensely irritating effect on the mucous membrane of the eyes and air-passages. Taken internally, in the form of paraformaldehyde, in doses as high as 90 grains, it produces no untoward effect. It is excreted by the kidneys. When injected subcutaneously in dogs, Pilliet observed congestion and degeneration change in the kidneys, liver, and spleen.

Formaldehyde is a blood-poison. Introduced into the body, it causes excitement followed by slow asphyxia, and added to the blood outside the body it destroys the corpuscles and produces hæmatin. The last body is formed without any preliminary change of oxy-hæmoglobin to reduced hæmoglobin. Benedicenti (Arch. f. [Anat. u.] Physiol., H. 3, 4, p. 210, '97).

Formaldehyde is not eliminated as such from the organism, but probably undergoes oxidation in the tissues. Polacchi's reagent gives, as the writer found, the same reaction with mucin and mucinogen as with formaldehyde, and this was the source of error in the previous investigations. Gianelli (Riforma Medica, Nov. 18, 1903).

The ingestion of paraform has not as yet been followed by fatal poisoning. Concentrated aqueous solutions in contact with the skin are somewhat like carbolic acid. The skin becomes rough and whitish; a sharp stinging is felt if the skin is abraded.

Proper treatment in poisoning by formaldehyde consists in the administration of spirit of Mindererus (the official solution of the acetate of ammonium). Large draughts of water were also given in a case reported. Editorial (Jour. de Pharm. et de Chir., p. 10, '99).

Large doses of lime water, a pint being given repeatedly, in a marked case of formaldehyde poisoning. Shortly after taking the first dose the patient was able to speak and complained of very severe burning in his mouth and stomach. The author ordered more lime-water, each time giving him a full pint until he had taken four pints. The

watery and salivary discharges ceased, and the burning sensations grew less marked. About fifteen minutes later the patient was able to walk and said he only had a little pain in his stomach. He did not get any other treatment, made a perfect recovery, and, at the same time, was perfectly sobered up. Stephen Fisher (Medical Council, July, 1904).

Therapeutic Uses.—The chief use of formaldehyde so far has been as an antiseptic and disinfectant. It has, as such, been highly recommended by Trillat and Roux, of the Pasteur Institute.

DISINFECTION.—In disinfecting a room the doors, windows, etc., must be made perfectly tight, as the diffusive power of the gas is very high. The gas may be generated outside the room in one of the various generators to be had, and the gas conducted by a tube through the key-hole. Some forms of apparatuses are operated within the apartment. After a sufficient amount of gas has been set free in the apartment, it is left for twenty-four hours. Length of exposure appears to be secondary to the quantity of gas used. An excess is recommended by most authorities.

Superficial instruments, bed-pans, urinals, bedding, surgical dressings may be sterilized in small closets or in suitable receptacles. Formaldehyde does not seem to affect the coloring matter of the wall-paper, drapery, or garments (except light shades of violet and light red), and for this reason it is preferable to chlorine as a disinfectant for apartments. After the disinfection is completed the rooms should be aired for some hours, as the gas is very irritating to the throat and eyes.

The various lamps are too small and give uncertain results. Two methods proved to be highly effective against the various bacteria with which rooms were infected: One by spraying the walls, furniture, etc., with a 2-per-cent. solution and allowing the room to remain

closed for twenty-four hours; 60 to 70 cubic centimetres of solution are enough for a square metre of surface. The other by evaporation from sheets dipped into a solution of half a kilogramme of calcium chloride in a litre of formaldehyde and hung in the room. The room is left closed until the next day. A sheet of two square metres is enough for eight cubic metres of space. The method by spraying is a very cheap process, but those engaged in the work must protect the eyes by a special form of glasses and the hands with gloves or vaselin, and must use a cotton-wool respirator. Nils Englund ("Om Formaldehyden," Stockholm, '95).

Pastils made of the solid polymerized formaldehyde (trioxymethylene) recommended. Each pastil weighs 1 gramme, and contains 100 per cent. formaldehyde, which is evolved by heating on a quite simple apparatus. After carefully closing all crevices in the room, the lamp of the apparatus is lit, and then the door closed. By burning one pastil for each cubic metre of room space, the author found that all non-spore-bearing organisms placed in any part of the room were killed after twenty-four hours. Aronson (Zeit. f. Hyg., Leipzig, B. 25, H. 1).

New lamp for disinfecting-purposes, consisting of a disk of moderately thick asbestos-board perforated with small holes close together and platinized with a strong solution of platinic chloride, and a lamp-font, which is a shallow, cylindrical dish of such size that the disk will just cover the top. This font is partly filled with methyl-alcohol. The disk is wet with the alcohol and removed from the dish, and then the alcohol is ignited. By the time the alcohol burns away the disk is sufficiently heated so that when placed over the lamp-font again it will continue hot and change the alcohol to the aldehyde most efficiently. The amount of alcohol converted in a given time depends on the size of the disk; with one of six inches' diameter a litre can be converted in an hour.

Not only is formaldehyde a germicide, but it renders innocuous the toxins of

tetanus, diphtheria, and many other organisms. It is of great value for disinfection of rooms. A 1-per-cent. solution deodorizes fæces. It is a far safer agent than corrosive sublimate, because it is not actively poisonous. It will satisfactorily disinfect the hands, will disinfect instruments without dulling them, and is a valuable agent in the sterilization of catgut. To wash wounds a 2-per-cent. solution to be used; to irrigate, a $\frac{1}{4}$ -per-cent. solution (Willard). Strong solutions are irritant even to sound tissues, and are used when we wish a caustic effect, as in chancroids or poisoned wounds. Vaginal gonorrhœa is benefited by irrigation with a solution of a strength of 1 to 1000, and the cervix can be painted with a 4-per-cent. solution (von Winckel). H. C. Wood (University Med. Mag., June, '97).

As the results of experiments made with formalin pastils burned in Schering's apparatus, conclusions reached, viz.: that formaldehyde is valuable as a surface disinfectant, and, as it does not injure the most delicate fabrics or papers, it can be used in any such apartment with safety. It failed, however, to kill germs wrapped in newspapers, although forty pastils were used in a room containing 1000 cubic feet of space, the time of exposure being twelve hours. Doty (N. Y. Med. Jour., Oct. 16, '97).

Formaldehyde very satisfactory when using 1 pound of formaldehyde per 1000 cubic feet, or 1 quart of wood-alcohol for the same space, and prolonging the actual time of generating the vapor to from one to three hours. Wyatt Johnston (Brit. Med. Jour., Dec. 25, '97).

Better results obtained in municipal disinfection by the use of formalin without any apparatus than heretofore with the various devices. Sheets suspended in the room were simply sprayed with the 40-per-cent. solution through a common watering-pot rose-head. A sheet of the usual size and quality will carry from 150 to 180 cubic centimetres of the solution without dripping, and this quantity has been found sufficient for the efficient disinfection of 1000 cubic feet of space. Of course, the sheets may be multiplied to any necessary number.

Cultures, both moist and dry, were exposed for five hours in these experiments—some in sealed envelopes and others wrapped in three thicknesses of sheets, or folded inside of woolen blankets. Of the former, none showed growth after seventy-two hours' incubation, while the growth was but slight in those wrapped in the blankets. Surface-disinfection was thorough, while a much greater degree of penetration was shown in these experiments than that secured by any other method.

The evolution of the gas from the sprinkled sheets is exceedingly rapid, so much so that it behooves the operator to vacate the room within a very few seconds.

After five hours the density of the gas is still so great as to preclude respiration until after doors and windows have been opened some time. Chicago Health Dept. (Jour. Amer. Med. Assoc., Apr. 23, '98).

For formaldehyde-disinfection Lingner has constructed an apparatus consisting of a vessel in which the water is boiled. The steam rises into a reservoir which contains 40 per cent. formaldehyde and 10 per cent. glycerin. This mixture is termed "glycoformal." From this reservoir four pipes pass out into the room. A room of sixty cubic centimetres is so filled with vapor in ten minutes that an electric lamp placed in the centre is no longer visible. All microbes are destroyed in three hours at the latest. The windows are thrown open for half an hour after the disinfection. Liquid ammonia is then placed in the room in an amount proportionate to the formaldehyde used. The windows are again opened, and thus all smell is got rid of. This method of disinfection can be carried out by the unskilled. Schlossmann (Berliner klin. Woch., June 20, '98).

Formaldehyde has no penetrating power; it acts best in dry air with high temperatures. It exerts no injurious action on furniture and other objects disinfected, and it is the most expensive of all processes. Symanski (Zeit. f. Hygiene und Infects., Aug. 19, '98).

Attention called to the power of this gas to penetrate the cell-walls of bac-

teria and destroys them. It retards their growth and destroys invading germs when they attack the respiratory tract. It can only be depended on to destroy pathogenic germs whose structure permits sufficient penetration to alter their protoplasm, and for this purpose it has no equal as a disinfectant. W. K. Jaques (*Merck's Archives*, Mar., 1900).

Formalin (a 40-per-cent. aqueous solution of formaldehyde) for disinfecting purposes after contagious disease is a cheap and certain destroyer of noxious germs. Basil Kluczenko (*Wiener klin. Woch.*, Oct. 11, 1900).

Of disinfectants that are efficacious, innocuous, automatic, and inexpensive, the best is formic aldehyde. It forms an odorless compound with ammonia, which becomes useful after disinfection, for removing the smell. It also makes gelatin insoluble, forming a hard, transparent mass. It is antiseptic, diffusible, and penetrating. Alfred Martinet (*La Presse Méd.*, April 30, 1902).

Formaldehyde has the property of hardening nitrogenous substances of the nature of gelatin. Cunningham (*N. Y. Med. Jour.*, Apr. 20, '95) makes use of this property in the preparation and sterilization of catgut. After this method of preparation the catgut can be boiled without destroying it.

GYNÆCOLOGICAL DISORDERS.—In vaginitis and catarrhal endometritis a tablespoonful of a 10-per-cent. solution of formalin to a quart of water has been found useful.

Formic aldehyde used in one hundred and fifty-five cases of diseases of women. It is an efficient remedy in vaginitis and catarrhal or blennorrhagic endometritis. It was used in the form of vaginal injections, 1 tablespoonful of a 10-per-cent. solution of formal to a quart of water, together with cauterization of the cervix and intra-uterine mucosa with the same 10-per-cent. solution. Von Winckel (*Les Nouveaux Remèdes*, Apr. 24, '94).

Under the influence of the injections of formaldehyde in gonorrhœa, a rapid

disappearance of the gonococci from the discharges observed, while the character of the latter was changed from purulent to serous. The injections should not contain more than 5 per cent. of formaldehyde. Orloff (*Wratsch*, July 4, '95).

Six cases of gonorrhœa treated with formalin. In every case the gonococcus was found. A $\frac{1}{2}$ -per-cent. solution used for injections. For the first two or three days irrigations of 1 quart of hot formalin solution were given twice daily; afterward once daily till the discharge ceased to contain the gonococci. No internal treatment was given except cathartic pills. All highly-seasoned food, alcohol, tea, and coffee were prohibited. The patients were advised to drink 2 or 4 quarts of pure water in the 24 hours. J. T. Howland (*Jour. of Cut. and Genito-Urin. Dis.*, 227, June, '96).

Good results claimed from the use of formaldehyde in gonorrhœa in women. Sixty cases, some very obstinate, were cured. The vulva was washed with a 1 in 1000 solution, and the vagina douched through a speculum with a strong solution, varying from 2 in 1000 to 5 in 1000. If the uterine cavity and cervical canal were involved, some of the same solution was injected. When there is laceration of the cervix, tampons soaked in 1 in 1000 of formaldehyde are left for two to three hours in the vagina. When fungous endometritis is present, the curette must be first applied. The applications give rise to no pain, and may be used daily, or every second day. De Smet (*La Semaine Méd.*, June 3, '96).

The recent announcement of the successful use of a weak formalin solution injected subcutaneously in a case of severe puerperal sepsis, followed by reports of other cases not so successful, has attracted much attention, both in the profession and out of it. We have known for some time that formaldehyde is an antiseptic of great power, and it has been used more or less successfully in a variety of conditions, but the consensus of opinion seems to have been that, while it is extremely active, it is too irritating to be used in any degree of strength in contact with delicate

tissues. The report from careful observers in New York that they had used considerable quantities of a 1 to 5000 solution subcutaneously or intravenously with what seemed to them good results, and certainly without causing any immediate apparent damage to the blood, gave rise to much interest in the profession and to some excitement in the daily press. However, the observers themselves will undoubtedly readily admit that one or two cases prove practically nothing, and those of us who have read the reports will be very loath to admit that any startling advance has been made.

The first case reported was evidently in a very bad way from uterine streptococcal infection, with a temperature of 108° F. (42° C.), and after the formalin injection there was a rapid fall in both temperature and pulse, followed by several performances of the same kind, a second injection of formalin meanwhile having been given. The argument of the observer was *post hoc propter hoc* as regards the injection, but it seems to us entirely too early to draw any justifiable conclusions in favor of the efficacy of the treatment, in spite of the fact that the bacteriological condition of the patient's blood improved rapidly. The violent extremes of temperature which this patient exhibited are not uncommon in severe cases of sepsis, and occur without treatment or after the subcutaneous use of salt solution and other forms of treatment; and we must remember that the uterus in this patient had only recently been cleared thoroughly of its septic contents when the formalin was used, so that any good effect from this intravenous treatment might also have been expected to manifest itself about the time when the amelioration of symptoms began.

The other cases reported are still too incomplete to discuss fairly, but we may note that in one an injection of only 100 cubic centimetres of a solution of formalin made by mistake 1 to 2500 instead of 1 to 5000 caused very serious collapse, with cyanosis,—symptoms which we are constrained to consider due to a poisonous action upon the red

blood-cells. If we are justified in this belief the margin of safety is evidently very narrow, and the need of extreme caution is very clear. The announcement in the lay press of a new procedure in medicine or surgery is always followed by much discussion, and often by a good deal of perhaps injudicious experimentation, into which medical men are sometimes practically driven in their relations with the enthusiastic laymen. It is, therefore, wise to emphasize the importance of an accumulation of evidence, and to await the results of more cases. We know so far that considerable quantities of formalin can be injected into the human circulation with reasonable safety, and in one or two instances the injection seems to have been followed by benefit; but we are not in the possession of a real cure for septiciæmia, and shall not be until we get a true antitoxin, and not a mere germicide. Editorial (Med. Record, Jan. 31, 1903).

VESICAL AND URETHRAL DISORDERS.

—Lamarque recommends the use of a 1-per-cent. solution for irrigating the bladder and urethra and a 5-per-cent. solution in chronic gonorrhœa. In hæmaturia and tuberculous cystitis it has also proved of value.

Formol in 1-per-cent. solution used for washing out the bladder and urethra, and in 5-per-cent. solution for instillation in these localities. It is particularly in cases of tuberculous cystitis that the treatment has been successful. The only disadvantage is the pain caused by the drug; this, however, though intense at first, quickly ceases. Daily washings with formol solution have been effectual in stopping hæmaturia, relieving pain, and lessening the frequency of micturition in cases where every other treatment had failed. In gonorrhœa the results were not satisfactory. Lamarque (Le Mercredi Méd., Sept. 11, '95).

Ammonio-formaldehyde seems to be almost a specific in some cases of uncomplicated acute catarrhal pyelitis. To prove effective it may have to be admin-

istered in large doses until the urine is practically free from bacteria, after which a smaller dose may be sufficient. In judging the effects of the drug the centrifuge and the microscope should be employed. The dose must not be sufficient to cause pollakiuria and dysuria by irritation of the neck of the bladder. The possibility of such an irritation cannot be overlooked even when small doses are given. Urotropin is extremely serviceable as a prophylactic of the various forms of urinary septicæmia and urethral chill. Its routine employment both before and after operations on the urinary passages is indicated. The urine containing urotropin occasionally has an escharotic effect upon wounds, which may constitute a contra-indication to its use. E. L. Keyes, Jr. (Phila. Med. Jour., Sept. 29, 1900).

CUTANEOUS DISORDERS.—Poitevin suggests the application of a layer of absorbent cotton dipped in a 2-per-cent. formalin solution and covered with an oil-silk or rubber bandage in parasitic diseases (ringworm) of the skin. Its vapors diffuse readily, even through masses of fatty matter, which makes it specially suitable for the treatment of deeply-implanted diseased hair, and also for the disinfection of the hair-follicles filled with sebaceous matter. In case of irritation of the skin, the bandage may be removed for a day. It has also been recommended in cases of psoriasis and lupus as a local application.

Good results from the use of the 40-per-cent. solution of formaldehyde painted on in ringworm of the scalp; 40 cases were thus treated, and microscopical examinations, made both before and after the application, showed the trichophyton to have disappeared in each case. Temporary irritation and production of a thick crust rendered the subsequent application of an emollient advisable. (Edema of the face, unaccompanied by pain or constitutional disturbance, was a remarkable complication in 6 of the cases, but was only noticed

when the area painted was large. Salter (Brit. Med. Jour., vol. ii, p. 650, '96).

When a watery solution of gelatin is allowed to dry in formalin-vapor the chemical characteristics of the gelatin are altered. It is no longer affected by hot or cold water, nor by acids or alkalies. Animal tissues, however, have the power of breaking up the combination and setting the formalin free. When the formalin-gelatin, ground to a fine powder and mixed with cultures of various forms of pathogenic bacteria, was introduced into animals, the bacteria did not develop, and the wounds healed without trouble.

With this formalin-gelatin powder every acute suppuration can be stopped in twenty-four hours, and wounds made to heal aseptically.

The writer has used it in 120 cases of acute suppurative processes, in 93 aseptic wounds, 4 compound fractures, and 2 deep scalp wounds. The wounds were only cleansed mechanically, and then thoroughly rubbed with the powder.

In cases of necrotic masses, in old ulcers, etc., the formalin-gelatin powder is dusted on the wound, and then covered with a dressing wet with the pepsin solution and the digestive process keeps up a continuous supply of formaldehyde-vapor for the wound. The powder is made by drying 500 grammes of purified and dissolved gelatin in the vapor of 25 drops of formalin. Schleich (Therap. Monats., Feb., '96).

Schleich's formalin-gelatin marks a distinct advance in the treatment of suppuration, giving the most perfect results in those cases where the cellulitis is moderate and the pus abundant. E. M. Foote (Med. News, Nov. 14, '96).

OPHTHALMIC DISORDERS.—Formaldehyde has been recommended as a disinfectant in ulceration of the cornea, the solution generally preferred for collyria being 1 to 2000. Stronger solutions should be applied immediately to the seat of the ulcer.

Excellent results obtained in infecting ulcers of the cornea and in purulent conjunctivitis. Corneal ulcers may be touched with a solution of 1 to 200 or

1 to 500 every day. For general use as antiseptic collyrium a strength of 1 to 1000 or 1 to 2000 may be used. S. M. Burnett (Ophthalmic Record, vol. v, No. 9).

Solution of 1 to 2000 of service in muco-purulent and follicular inflammations of the conjunctiva, when applied thrice a day to the everted lids. In trachoma it seems to have the power of reducing the amount of secretion. S. Stephenson (Brit. Med. Jour., Jan. 25, '96).

The most serviceable solution of formaldehyde is 1 part of formalin to 2000 or 3000 of water. This is of very great value when used freely in infected abrasions of the cornea and in hypopyon ulcers. J. M. Davidson (Ephemeris, p. 1843, Jan., '97).

DISORDERS OF THE RESPIRATORY TRACT.—In the treatment of diseases of the nose, larynx, and lungs formaldehyde has been recommended by a number of observers, in solutions ranging from 2 to 40 per cent. Although these reports merit credence, the fact remains that the irritation produced is such as to deter many from using it in preference to other means.

Excellent results obtained in the treatment of rhinitis, otitis media, and laryngitis by passing through the nose a stream of air which had bubbled through a solution of 5 per cent. of formalin in water. Deschamps (Annales des Mal. de l'Oreille, etc., Apr., '94).

Inhaler devised for the treatment of pulmonary tuberculosis by formaldehyde which produces a vapor of 2-per-cent. to 10-per-cent. strength. The odor may be disguised by Austrian pine. The coughing-spells become less troublesome and the quantity of fœtid expectoration is diminished. Rosenberg (Deutsche med. Woch., Nos. 39 and 40, '96).

In the treatment of laryngitis and chronic nasal affections the writer places a 5-per-cent. solution of formalin in a glass carafe and instructs the patient to inhale the vapor which arises therefrom on shaking the vessel. This treatment is carried out two or three

times a day and lasts from five to ten minutes. In the treatment of acute laryngitis the results are most favorable, a complete cure being arrived at in from seven to twenty-four hours in the sixteen cases in which it was tried. In three cases of acute coryza the condition disappeared in twenty-four hours after the use of three or four douches of a weak formaldehyde solution. Yatecoute (Revue de Thérap., Apr. 15, '97).

In atrophic rhinitis after removal of all the crusts and *débris* with a weak alkaline solution, each nostril is thoroughly washed out with a solution of formaldehyde, containing 5 to 10 drops of the 40-per-cent. solution to 8 ounces of warm water. As it is very irritating, a preliminary spraying of the nose with cocaine is advisable. At home patient has 1 drop added to the solution used in the douche-cup for the daily cleansing. Under use the crusts diminish in number and all unpleasant odor ceases. George L. Richards (N. Y. Med. Jour., vol. lvii, p. 826, '98).

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FRACTURES.

Definitions.—The sudden, forcible destruction of the continuity of a bone, in whole or in part, except when done with a cutting instrument, is called a fracture (Stimson). More briefly, a fracture is a laceration or crushing of a bone. A *simple* fracture is one that is not compound or comminuted. A *compound* fracture is one in which a wound of the soft parts establishes a communication between the fracture and the outer air. The fracture is *comminuted* when the bone is splintered. *Multiple* fractures, on the other hand, are several separate fractures in the same bone or in several bones (but this term is not applied to a simple fracture of one forearm or leg). A *spontaneous* fracture is one produced by an insignificant violence. A fracture occurring on account of a predisposing

disease of the bone is called *pathological*. An *ununited* fracture is one in which bony union has not taken place after the lapse of the usual length of time. The terms *delayed union* and *fibrous union* usually express the same condition. A "green-stick" fracture is an incomplete fracture of the shaft of a long bone accompanied by a bending of the bone.

Varieties.—The following is the simplest classification:—

1. Incomplete fractures:—

- (a) Fissure.
- (b) True incomplete "green-stick" fracture.
- (c) Depressions.
- (d) Separation of a splinter or apophysis.

2. Complete fractures, subdivided according to

- (a) The direction and character of the line of fracture,—as transverse, oblique, longitudinal, dentate, V- or T- shaped, and comminuted.
 - (b) The seat of the fracture, as fracture of the shaft of the neck, head, shaft, separation of the epiphysis, etc.
 - (c) If extending into a joint, intra-articular fractures.
3. Multiple fractures.
4. Compound fractures.
5. Gunshot fractures.

Symptoms.—**DEFORMITY.**—Under this head are included all the changes in appearance and dimension of the injured part. Some deformity is always present, dependent upon the contusion or laceration of the soft parts, or, what is much more important, the displacement of the bone-ends upon each other. This displacement may take place in six ways (Malgaigne), though the actual displacement is usually the result of a combina-

tion of several of the original ones. These six primary displacements are: 1. Transverse or lateral. 2. Angular. 3. Rotary. 4. Overriding. 5. Impaction or crushing. 6. Direct longitudinal separation. Displacement is caused by the combination of the trauma and the muscles attached to the fragments. Most of the various displacements can be recognized by the eye or finger, but if the seat of the suspected fracture is covered by a thick layer of soft tissues, and especially if the contusion of these soft parts has given rise to a considerable amount of superficial deformity, mensuration must be resorted to. Measurements are best taken from bony points at opposite ends of the bone whose fracture is suspected, and the shortening or lengthening ascertained by comparison with the distance between the corresponding points on the opposite side of the body (*e.g.*, the sound limb). Unfortunately, however, it is often impossible to take measurements with any degree of accuracy from two points on the same bone, consequently the rule that must always be borne in mind, *viz.*: for a comparison of the measurements of the sound and the injured limb these measurements must be taken with the limbs in not apparently, but really corresponding positions. Two other sources of error are: first, that the length of limb in some subjects is normally asymmetrical; and, second, that previous disease may have affected the length of some one of the bones measured. Circumferential mensuration of a limb is valueless, for the increase in circumference of the injured limb, in cases where the bone deformity cannot be readily made out, is usually due more to the effusion of blood into the soft parts than the overlapping of the bone-ends. The deformity of the soft parts is such as is caused by what-

ever contusion or laceration they may have received. Generally speaking, the swelling increases for twenty-four to forty-eight hours, and then gradually subsides, its subsidence being hastened by treatment: a fact which is of the greatest importance in reference to the application of splints.

ABNORMAL MOBILITY and **crepitus** are the two other objective symptoms of fracture and are pathognomonic. In exposed positions the former sign may be elicited by directly grasping the segments of the bone and moving either upon the other; in other cases (fracture of the surgical neck of the humerus) the surgeon must be satisfied with determining that the motions (rotation) of one fragment (the shaft) are not imparted to the other, as indicated by the immobility of one of its bony points (the greater tuberosity). Again, abnormal mobility near a joint may simulate abnormal mobility of the joint itself, and special care be necessary to differentiate between fracture and dislocation.

CREPITUS is the grating sensation heard or felt when the two rough bone-ends rub against each other. The intervention of soft parts between the bone-ends, of course, prevents crepitus, which may, on the other hand, be simulated by crackling of coagulated blood, by roughened joint-surfaces, by teno-synovitis, and by emphysema. Finally, be it especially noted that although abnormal mobility and crepitus are pathognomonic, they are often by no means necessary to the diagnosis of fracture, and the manipulations which they require may be not only extremely painful, but also, by producing further lacerations of the soft parts, positively harmful to the patient.

LOSS OF FUNCTION is usually present to a greater or less degree and is due to the weakness of the part or to the pain

evoked by motion or pressure; but this symptom is liable to be misleading, for, while one patient may use a fractured limb with great freedom, another may be totally disabled by a mere contusion.

PAIN.—This is always present, except when the patient is unconscious, and is either spontaneous or aroused by pressure or movement. The characteristic pain of a fracture is localized over the point of fracture and may be elicited, not only by pressure over this point, but also by pressure at other points along the fractured bone. Such a pain, together with a history of injury, may sometimes constitute sufficient evidence of fracture, notably in fracture of the ribs or of the fibula.

CLINICAL PICTURE.—Immediately after the accident the torn vessels pour out their blood into the tissues, and within a few hours œdema sets in on account of the occlusion of the lacerated veins and lymphatics and the obstruction of others by the pressure of the extravasated blood. The temperature may rise a degree or two, blebs appear on the surface, and the tense skin discolored by ecchymoses. The discoloration which may appear a few days later, as the blood extravasated among the deeper tissues makes its way to the surface, perhaps at some distance from the point of fracture, is a presumptive sign that a bone-lesion exists. In from one to five days—more rapidly under appropriate treatment—the œdema subsides and the swelling is reduced to a hard lump, the mobility of the fracture becomes less, crepitus is no longer obtainable as the fractured bone-ends become covered with granulations, and, finally, after a few weeks abnormal mobility entirely disappears and the fracture is said to be united. But the patient is not yet well. Disease has stiffened the joints and weakened the

muscles so that several weeks or months will be required before the limb regains its usefulness, while in cases where the proper care of the joints has been neglected they may remain permanently stiffened.

Diagnosis.—The degree of fracture should always be made with the least possible manipulation. A consideration of the patient's history, together with careful inspection, gentle palpation, and accurate measuring will usually suffice. If not, gentle manipulation of the injured part may be made use of for the purpose of eliciting abnormal mobility or crepitus. To this end general anæsthesia is of great assistance by relaxing muscular spasm and removing pain; but with these safeguards against further laceration thus removed, manipulation should be doubly gentle. Moreover, a slight, gentle movement will often be of service when a brusque or violent one will fail.

In obscure cases the use of the X-rays by fluoroscope or sciagraph may be resorted to instead of anæsthesia; but when operative interference is necessary, or when complete insensibility is requisite for the "setting" of the fragments, the use of the rays is not called for. In fact, the safe rule is to use the rays for diagnosis as little as possible, for dependence upon the ordinary clinical data and the careful use of trained eyes and fingers are productive of far better clinical results than is the use of an instrument whose finding may be misleading and which tends to shroud the clinical aspect of the case in the silvered cloud of scientific accuracy. In doubtful lesions about joints, however (notably the hip and shoulder), and in supposed fractures of the spine or pelvis, the rays may be of great service, and they are of undoubted use also in some cases where operation

for non-union is contemplated, and occasionally to determine the condition of the bones of a limb in fixed splint. Their application to scientific and statistical investigation is beside our subject.

Differential Diagnosis.—**DISLOCATION.**—In dislocations there is abnormal motion where there was motion before. In fractures there is motion where there was none before. Moreover, if, in dislocations the range of motion is increased in one direction, it is usually diminished in the opposite direction, while a fracture usually gives abnormal mobility in all directions. Crepitus is pathognomonic of fracture.

CONTUSION.—Position and pressure for a few days ought to reduce the swelling of the soft parts sufficiently to permit a satisfactory examination. Contusions of the hip form the exception. If even the X-rays fail to clear up the diagnosis satisfactorily, the only safe treatment is that for fracture.

If every "dislocated wrist" and every "contused hip" were regarded and treated as a fracture, the world would be none the worse for it.

Etiology.—**PREDISPOSING CAUSES.**—Sex, age, and occupation are remote predisposing causes of fracture. Men suffer more frequently from fracture than women, for they are much more often exposed to injuries of all sorts. Yet after the age of seventy, women suffer many more fractures than men, chiefly of the neck of the femur. Again, while by far the greater number of fractures occur in the first three decades of life, the proportion of fractures *per capita* is at its maximum at about the age of sixty. More definite predisposing causes, however, reside in the anatomical and pathological condition of the bones and the system in general. Normally, the shape, structure, and functions of various bones

expose them more or less to fracture, the liability to which is increased by the changes incident to advancing years. The curves in the long bones and their broad spongy ends, so well adapted to transmit the minimum of danger to more vital organs, render them, for that very reason, more liable to give way under excessive violence. Seventy-six per cent. of all fractures occur in the ribs, clavicle, forearm, hand, and leg, while the upper extremity, the weapon of offense and defense, receives 51 per cent. of the total. The middle aged and the aged, while less exposed to trauma than the young, receive more than their share of fractures, partly because of their decreased agility, the normal stiffening of their muscles, but mainly on account of the normal changes in the osseous system. As age advances, the spongy and the compact tissues of the bones become gradually rarefied, not by any changes in the proportions of their bony constituents, not by any deposit of lime-salts, but by an actual diminution of the amount of the bone-tissue. Such changes are pathological only when they occur at an early age. In a few cases an unlimited tendency to this early bone-rarefaction has been observed. Such fractures usually heal kindly, and refracture through the line of union is the exception, although, in the more pronounced forms, the patient may scarcely have convalesced from one fracture before some slight accident disables him with another one. A similar bone-fragility may be acquired through prolonged disuse or consequence of lesions of the nervous system.

Rachitis in children and in later days syphilitic bone-lesions, bone-tumors, and inflammations act as predisposing causes of fractures, and notably delay, if they do not entirely prevent, the process of repair. The existence of rheumatism as

a predisposition is very doubtful, the pathological connection between the two not having been demonstrated, and the clinical history of "aches and pains" probably a mere coincidence.

DETERMINING CAUSES.—These either come from without in the shape of trauma, or from within as muscle-action.

External violence may be applied directly (direct violence) to the part of the limb that breaks, or indirectly (indirect violence), and it then acts by leverage, vibration, or the associated muscular action. The effect of molecular vibration as a cause of fracture is sometimes seen in bullet wounds. A bullet, for instance, passing cleanly and with no shattering through the lower end of the tibia, has been known to comminute the head of the bone into a number of small fragments, although leaving the major part of the shaft intact, a result only attributable to vibration, and quite comparable to the splitting of a baseball-bat near the handle by impact with a ball at some distance from the point of fracture. The "explosive" action of bullets on the skull is similarly attributed to the waves set up in the soft contents of the cranium.

The distinction between fractures by direct and indirect violence is an important one in compound fractures, for the greater laceration is likely to be at the point of impact, and consequently in the former class the wound is usually large and irregular, while in the latter it is commonly a simple puncture by a sharp bone-end, a distinction which intimately affects the treatment.

Muscular action is the usual cause of fractures of the patella.

Pathology.—We need not concern ourselves here with the lacerations and the process of repair of the soft parts. As for the bone, it may give way more or less completely and in one or more places (see

VARIETIES). If the fracture amounts to anything more than a simple fissure, the periosteum is torn and usually stripped up for some distance. As a rule, however, it remains untorn at one side, thus forming a so-called "periosteal bridge"; a valuable adjunct to repair, and tending to insure the life of all fragments that remain attached to it.

The bones are displaced, as we have seen, in various ways, and if the displacement is considerable and the bone-ends angular, a great deal of damage to the soft parts may result from injudicious handling, a secondary compounding of the fracture being a not infrequent result of carelessness in manipulation and transportation, especially in fractures of the leg.

BULLET WOUNDS.—Recent researches are tending to clear up the mystery surrounding the contradictory reports on the effect of modern projectiles. A slowly-moving bullet, one almost spent, if it strike a bone will bore through it more or less completely and splinter it more or less widely in a manner that can be explained by the velocity, the angle of impact, and the quality of the bone; but with a swiftly-moving, small-calibre bullet, another force has to be considered,—that of vibration. If the vibration imparted to the bone by the projectile is such that the point of impact of the projectile coincides with a nodal point, the bullet will simply pierce the bone and no shattering will result. But if the point of impact does not coincide there will be more or less shattering at the point and at the extremities of the bone, the amount of shattering being dependent on the amount of vibration imparted to the bone. Now, the qualities in the bullet that tend to produce vibration are its momentum (weight and speed), which is imparted more or less to the bone as

the bullet is larger or smaller and at its point is harder or softer. Consequently the shattering power of a bullet increases with its velocity, its weight, its size, and its capacity to flatten out when it strikes a hard object.

In bullet wound of the cranial cavity, and to a less degree of the thoracic and pelvic cavities, the amount of damage is, again, often dependent on the vibrations produced, the waves set up by the passage of a solid object through a semifluid medium, more or less hermetically sealed within an unyielding envelope. Whereas the even passage of the bullet does comparatively little damage, the waves of motion it produces may suffice to literally blow the top of a man's head off.

THE PROCESS OF REPAIR.—The first attempt at repair is seen in the periosteum, which throws out a layer of granulations. These become cartilaginous and finally bony, being the only portions of the callus to pass through a cartilaginous stage. The bone and marrow also share in the separative process, but to a less extent. They throw out granulations, which combine with these from the periosteum to fill the whole space between the bone-ends, even the medullary canal (forming the so-called "medullary plug"). The bone acts more slowly than the periosteum on account of the relative scarcity of its cellular elements, and because it has the added task of dissolving and making away with the thin layer of bone-substance which is infallibly destroyed at the point of fracture. The callus thus thrown out forms a large irregular mass, whose size is increased in proportion to the degree of displacement, the amount of comminution, and the lack of immobilization. If the callus is thus rendered unduly large, it may involve adjoining tendons, nerves, or joints, thus complicating recovery. If the line

of fracture runs into a joint, it may become permanently immobilized by osseous union of its articular surfaces.

Fragments detached from the periosteum may regain their vital connections by revascularization of their Haversian canals, or they may remain imbedded in the callus as innocuous foreign bodies. In this condition they may ultimately lead to suppuration.

If the vital energy of the bone-forming elements is not sufficient to form bony union, the callus remains fibrous. The usual causes of fibrous union are systemic debility, separation of the fragments, faulty immobilization, and the presence of foreign bodies,—*e.g.*, wire sutures.

Ultimately the medullary plug is absorbed and the callus becomes entirely bony, shrinking, in cases that have been completely reduced, almost to a simple layer between the bone-ends, any sharp angles of which are also gradually rounded off by absorption.

Repair of Compound Fractures.—If they heal by first intention their repair follows the same course as that of simple fractures, but when suppuration occurs partly detached fragments that would otherwise have lived are cast off, and the ends of the larger fragments also die, and act often for long periods of time as foreign bodies to which sinuses run, after all active suppuration has ceased. In such cases the dead bone should be cut down upon and removed. After suppuration none of the callus goes through a cartilaginous stage.

Prognosis.—The prognosis depends on many conditions, the extent of the injury, the associated lesions, and the age and general condition of the patient. Again, the prognosis for certain fractures (clavicle, Colles's) is far better than for others. Among the accidents that may imperil the patient's life are *embolism* of

a clot from an injured vein into the heart or lung, causing instant death (see *EMBOLISM*), or *fat-embolism*, a very rare condition which occurs during the first few days after fracture. The symptoms may be those of embolism or shock, or there may be more or less characteristic signs of œdema of the lungs. Post-mortem examination reveals the fact that the pulmonary capillaries are obstructed by minute globules of fat, which have been poured into the gaping vessels from the torn bone-marrow. If the patient recovers the diagnosis of fat-embolism cannot be made with any certainty.

Shock is a frequent cause of death, which usually occurs within the first forty-eight hours, and in compound fractures death may occur from hæmorrhage, or later from tetanus or septicæmia or pyæmia. Delirium tremens is a frequent complication. The shock, the withdrawal of customary alcoholic stimulation, and the confinement to bed all tend to induce it. Besides the customary administration of hypnotics, stimulants, and nourishment, it is of the greatest importance to get such patients up and about while they are still in the premonitory stage of restlessness and insomnia. They must be gotten out of bed at any cost. I have seen this expedient succeed in abating an attack of delirium tremens when all other means bade fair to fail. Finally, gangrene may result from laceration of the main vessels of a limb or from their compression, whether by the displaced fragments or by a splint unskillfully applied.

Local sloughing of the tissues may occur from the pressure of a sharp point of bone, or, more commonly, by extravasated blood. The reduction of the fracture, followed by the application of heat and pressure and the elevation of the limb, constitute the elements of prophylaxis.

laxis in such cases, to which must be rarely added incisions for the evacuation of clots or the ligature of bleeding-points.

Other early complications are the secondary compounding of the fracture by a sharp point of bone, and the formation of a traumatic aneurism in a lacerated artery.

Complete recovery may be delayed or prevented by exuberant, painful, or weak callus. The callus always is "exuberant" at first, and may be expected to grow somewhat smaller even after bony union has taken place, but experience has proved that large masses of callus that impair function will not disappear in the course of nature nor under any medical, mechanical, or electrical treatment. They must be exposed and chiseled away, and in this connection it is well to remark that in old cases it may be impossible to tell before operation whether the offending mass is a badly-reduced fragment or exuberant callus. Persistent pain in the callus may be due to pressure on a nerve or the inclusion of nerve-filaments in the callus, or to suppuration about a sequestrum. If the pain cannot be explained, it is called "osteoneuralgia." Weakness of the callus, if not caused by undue separation of the fragments or constitutional debility, is usually due to inefficient immobilization. It is not an uncommon consequence of suppuration in a compound fracture.

Stiffness of the joints is, to a certain extent, the natural result of the immobilization necessary to secure union in the fracture. But this stiffness should be transitory except in the old and rheumatic, or unless the joints are sprained or involved in the fracture. In this last event permanent bony union of the opposed bone-surfaces may occur, or exuberant callus may interfere with the movements of the joints. The joints of

the fingers, however, are very liable to remain stiff if they are immobilized for more than two weeks, especially if in the position of extension.

Atrophy of the muscles may be permanent in old and debilitated persons. In whom also spontaneous dislocations and fragility of the bones may result from disease.

Tumors—primary sarcoma and secondary carcinoma—may occur at the seat of fracture, and secondary carcinoma may occur in the epithelium lining of the old sinuses of compound fractures.

Permanent paralysis may result from laceration of or pressure on the nerves.

Treatment.—**REDUCTION.**—The surgeon's first duty, unless the associated injuries or shock demand immediate attention, is to "reduce" or "set" the fracture; that is, to restore the fragments to their normal position, or at least to that position in which he intends them to unite. This first step in the treatment, and the next one, immobilization, must be carried out as soon as possible in order that the displaced fragments shall do no further damage to the soft parts. Of course, in such fractures as do not need reduction (*e.g.*, ribs) immobilization is alone required. If the patient's general condition contra-indicates such extensive manipulations as are required to reduce a complicated fracture, the bones must be immobilized as completely as possible in their abnormal positions. In compound fractures, moreover, special indications exist for primary immobilization. These will be discussed in a subsequent paragraph. Reduction should not be made if the spongy tissue of the bone has been crushed so severely that if the distal fragment were replaced in its normal position a gap would exist between the fragments.

To effect reduction the least possible

force must be applied. Ordinarily speaking, gentle traction is made upon the distal fragment by the hands of an assistant, while the surgeon manipulates the broken ends, bringing them gently into position. General anæsthesia may rarely be necessary to relax the muscles.

Immobilization is effected by means of splints. Any dressing used to immobilize a fracture is called a splint. Of temporary emergency splints, the simplest and most generally applicable are made of wood. They should be broader than the limb to prevent constriction when they are bandaged to it, and, generally speaking, longer than the fractured bone. They should be padded on the side next to the limb and should be light and yet strong enough to maintain the bones in their proper positions. These splints are held in place by a roller bandage or strips of adhesive plaster.

Generally speaking, nothing should be applied to the limb under the splint except some elastic substance, such as cotton or wool,—the so-called carded wool makes the most comfortable (and expensive) dressing,—which will equalize the pressure of the splint and absorb the perspiration of the limb. In some cases, however, it may be deemed advisable to apply about the seat of fracture a number of coaptation splints: small thin pieces of wood, about an inch broad and some six inches long, wrapped in cotton, which, when bound about the limb at the seat of fracture, keep the bone-ends in apposition by direct pressure. But it must be borne in mind that they do not prevent angular deformity.

As a general rule, in applying splints the joints at the extremities of the fractured bone should be immobilized.

If dressings are applied circularly to a limb they imperil its circulation and

may give rise to gangrene if any swelling occurs in the limb subsequent to their application. Consequently they should not be used until the primary swelling has occurred, and, when used at any time, they should be frequently inspected.

Bony excrescences should be protected by padding *about* them, not *on* them.

Permanent wooden splints may be constructed after the fashion described above. Carved wooden splints are troublesome and expensive to obtain, and have no peculiar advantages.

Gooch's flexible wooden splint (Fig. 1) combines the advantages of lateral



Fig. 1.—Gooch's flexible wooden splint.
(Stimson.)

and coaptation splints. They are made by fastening a number of thin strips of wood side by side. Molded splints have almost certainly replaced them at the present day.

Fracture-boxes have been almost universally supplanted by more convenient apparatus. They are used only for fractures of the leg and are essentially a combination of a posterior splint with a movable foot-piece and two lateral splints hinged to it. The fractured limb is placed on the posterior splint appropriately padded, the padding folded over the splint, and the sides turned up. It

may be suspended like a Hodgen or Smith splint with advantage. The heel is protected from pressure by the same device as serves in

VOLKMANN'S SPLINT.—This is as good as any temporary splint for fractures of the leg. It is a simple gutter of tin of such a length as to reach six or eight inches above the patient's knee. At its lower end a U-shaped piece is cut out to admit the heel, and to this end is attached a foot-piece, which is supported on an inverted T-shaped rest. To apply it the gutter is filled with cotton or wool and a bandage applied over leg and splint. The heel may be protected either by padding very snugly for some distance up the leg on either side of the tendo Achillis or else by attaching a piece of adhesive plaster to the back of the leg and the sole of the foot and attaching to it another piece of plaster which is carried over the toe of the foot-piece and stuck to its base. The former method allows the foot to sag, the latter does not.

MOLDED SPLINTS.—Wire gauze is a convenient material to mold over a limb for a light splint. Leather and felt are similarly made use of. After being thoroughly soaked in water they are molded and bandaged to the limb and allowed to dry in place. Gutta-percha previously heated and molded has also been used. All of these have, however, been supplanted by plaster-of-Paris and silicate-of-soda (artificial glass) splints. To make a plaster splint a number of thicknesses of gauze, muslin, or blanketing of the desired dimensions are immersed in a freshly-made solution of plaster-of-Paris of the consistency of thick cream (a small amount of common salt or, better, sulphate of zinc added to the fluid makes it harden quicker) until the material is thoroughly impregnated. It

is then squeezed out and applied to the limb which has been coated with vaselin in the meanwhile. If the splint must turn a sharp angle (elbow or heel) it can be fitted by notching its edges and overlapping the edges of the notches. It is then bandaged in place until it dries, after which it may be retained by a few turns of the bandage or adhesive plaster. Such splints are not very strong (but may be strengthened by incorporating in them rods of iron or wood), but they offer the great advantage of allowing the fracture to be inspected with the minimum of disturbance. The plaster bandage is most conveniently made by rolling a gauze bandage loosely, filling it at the same time with dry plaster. The bandage is allowed to soak for a few minutes in a hot, weak solution of sulphate of zinc and is then applied to the limb previously incased in a thin layer of cotton or a stocking. The bandage is best applied as an "anterior reverse," without actually reversing, however. Dextrin, starch, glue, and silicate of soda (the last being the best) are similarly used. The most convenient way to apply such bandages is to rub the solution into each layer of the bandage after it is applied. Silicate-of-soda bandage is more elegant than the plaster-of-Paris, but it is not so strong nor does it "set" so quickly. Such bandages may be fenestrated by cutting out a piece of the plaster after it has hardened, or interrupted by incorporating in the two sections of the splint the ends of two or three — shaped and straight bands of iron. Such interruptions are likely to weaken the splint. To cut a plaster splint for fenestration or removal the best instrument is a short, sharp, stout-bladed knife, whose efficacy is enhanced by wetting the line of section with dilute hydrochloric acid. To prevent shorten-

ing the splint must have points of counter-pressure at opposite ends of the fractured bone. The edges of fenestration may be protected by rubber tissue or varnish.

The toes and fingers should always be left exposed, and they should be frequently inspected during the first few days in order that the splint may be removed in case it interferes with the circulation. If the patient is then to pass from the constant observation of the surgeon he should not be allowed to go until he has been watched for twenty-four hours with his limb as dependent as it will be during the convalescence. Then he and his friends must be carefully instructed as to the dangers of which coldness, swelling, and discoloration of the digits are the forerunners, and warned to report before gangrene has set in. Subsequently it will be well to inspect the splint once a week in order to be sure that the limb has not shrunk enough to allow motion at the seat of fracture. A good routine rule is that the splint shall be reapplied every ten days.

AMBULATORY SPLINTS.—We seem to have seen the crest of the wave of the “ambulatory” treatment of fractures, in which, as in all things else, there is some measure of virtue. In a certain sense every patient who walks on crutches is receiving an ambulatory treatment for his broken leg, but in that there is nothing new, nor in the application of one of the many forms of hip-traction splints, so long used for the treatment of disease in that joint, to fractures of the femur. The novelty, the real “ambulatory” splint, is a heavy plaster-of-Paris bandage splint reinforced with a ring of several extra turns of the bandage just under the tuberosities of the tibia and usually strengthened by incorporated bands of iron or strips of wood in such fashion that

the weight of the body is transmitted from the head of the tibia to the ground, not through the splint, the foot being elevated by a sole of cotton or wool at least two inches thick or by a steel “stirrup,” which is incorporated into the plaster and upon which the patient walks. The advantages claimed for this method of treatment are that it avoids the risks of confinement in bed and shortens convalescence by lessening the atrophy of the muscles and the stiffness of the joints. On the other hand, such splints cannot be used with safety in every oblique fracture or in fractures that allow any great mobility, and they certainly increase the danger of mobility within the splint. Moreover, some patients absolutely refuse to “amble,” and those who will walk are usually able to get as much comfort out of a light, comfortable plaster splint and a pair of crutches as they can from such a cumbersome appliance. That they cannot get out of bed sooner than with crutches is evident, and that the convalescence is shortened by walking on the ambulatory splint does not seem to have been absolutely proved; yet in some cases they may prove very satisfactory.

TRACTION.—Continuous traction must sometimes be combined with immobilization, notably in fractures of the thigh. Elastic traction involving complicated apparatus and exercising an indefinite force has been superseded by the weight and pulley. As the various apparatus are designed only for fractures of the femur, they will be described under that title.

DIRECT FIXATION.—Very rarely necessary or advisable except in compound fractures, in fractures of the patella (and possibly of the olecranon), and in cases of delayed union. Of course, if, for any other reason, such as the removal of a fragment, it is desirable to cut down the

seat of fracture, it is but discreet to throw a few supporting sutures about the bone-ends to insure their more accurate apposition. In so doing the one important caution to be borne in mind is that any bone transfixed or constricted by a metallic peg, plate, or suture is liable to become necrotic. Consequently some absorbable gut or silk is the only form of suture material that may be used with safety. And, as a matter of experience, it may be added that periosteal sutures of stout catgut seem to last long enough to fulfill every requirement. It is true, however, that wire sutures may be used if their ends are left long, so that they may be untwisted and extracted at the end of ten days or two weeks.

MASSAGE.—In the first week massage hastens the disappearance of the swelling, and if used during the whole convalescence notably lessens the subsequent stiffness and atrophy (Lucas-Championnière), but the expense of such treatment as well as the danger of disturbing the fragments nullifies these slight advantages in most cases.

MANAGEMENT OF THE JOINTS.—During the early stages of convalescence the joints should be immobilized and subjected to massage and elastic compression if they show any marked inflammatory reaction. Later, when the acute stage has passed they may be subjected to systematic passive motion, the massage and pressure being continued. Passive motion should never be insisted on, however, as long as its use causes persistent pain or increases the stiffness. Indeed, ordinary use is the best form of exercise. Forced passive motion (*brisement forcé*), with or without anaesthesia, should never be attempted, for it is sure to be detrimental, unless the obstruction is a single slight band whose rupture would not be followed by any great reaction: a rela-

tively rare condition. If gentle passive motion prove ineffectual, the joint may be subjected to dry heat (300° F.); and, this means also failing, if greater mobility is absolutely essential, recourse may be had to open arthrotomy with systematic division of adhesions or the removal of any obstructing callus. In addition be it noted that in the larger joints stiffness rarely persists, but in the smaller ones it may be permanent. This is notably the case with the *extended* fingers. Fingers should always be immobilized in the fixed position, and passive motion on them never postponed beyond the end of the second week.

COMPOUND FRACTURES.—If the wound leading to the fracture is small, clean, and not contused, as is usually the case, in compound fracture by indirect violence, the wound and any projecting ends of bone should be thoroughly cleansed, the fracture reduced with as little enlargement of the external wound as possible, the wound loosely sutured, and primary union expected. In case the wound heals aseptically the course is that of a simple fracture, but, if suppuration sets in, the wound must be promptly opened up, thorough drainage provided for at dependent points, and irrigation instituted either continuously or, at least, often enough to keep it mechanically clean until healthy granulations occur, after which the healing is concluded under local treatment appropriate to granulating wounds.

If, on the other hand, suppuration has already set in or seems inevitable from the contusion or the dirty condition of the tissues, provision must be made at once for thorough drainage, and the preliminary irrigation must be copious, better results being obtained from irrigation with large quantities of a weak solution than with smaller quantities of

a stronger one, whose irritating properties kill the tissues as well as the bacteria. Yet even the most desperate cases may do well if after this extensive cleansing they are left alone for five or six days in the hope that during that time partial healing may at least diminish the size of the abscess-cavity and perhaps shut off the bone from it entirely. Of course, in the presence of evidences of existing suppuration, the surgeon may not hesitate to institute the most vigorous antiseptic treatment, but in doubtful cases the disturbance incident to frequent changes of dressing will certainly result in suppuration, while the expectant treatment may have a happier issue.

The necessity of removing detached fragments of bone depends almost entirely upon the prospect of suppuration. In a clean wound fragments that are entirely detached may lie, while in the presence of pus even the ends of large fragments will be cast off.

To estimate the amount of sloughing that will occur Esmarch's artificial ischæmia is a safe guide, those parts being doomed to which the blood does not flow on the removal of the bandage. But it is inadvisable to attempt any extensive clearing away of dead tissue until the bone has begun to granulate and the line of demarkation has formed.

The suture of periosteum, fasciæ, muscles, nerves, and tendons and the ligation of bleeding vessels merit no especial notice here.

As to the indications for resection or amputation, no definite rules can be laid down. In cases of doubt, however, it is always safe to delay amputation until it is clearly impossible to save the limb. Thus the patient is given every chance and the surgeon may avoid being sued for malpractice.

As to suppurating compound fractures of the larger bones they need almost never be despaired of, from twelve to eighteen months being none too long for their ultimate and satisfactory recovery.

PSEUDARTHROSIS, OR DELAYED UNION.

—When on account of a constitutional taint (*e.g.*, syphilis), a drain on the system (pregnancy, lactation), a cachectic condition, or most commonly an imperfect reduction or inefficient immobilization of the fragments, the fibrous callus which unites the fragments fails to ossify after a sufficient length of time has elapsed, the bone-formation should be stimulated by attention to the patient's general condition and such measures as will produce local irritation. Among the local measures the most successful have been the production of congestion by occasionally constricting the limb above the point of fracture for a sufficient time to cause decided venous congestion, the injection of a few drops of a 10-per-cent. solution of the chloride of zinc into the callus, the use of electricity with one needle in the callus and the other on the surface of the limb, or the wearing of a splint loose enough to allow a slight amount of motion at the point of fracture. These failing, the only alternative is to cut down on the fracture, to cut away the callus, and suture the bones into place with catgut. If a gap remains this is to be filled by decalcified or powdered bone. A gap in the tibia may be done away with by removing a section of the fibula. The use of wire is contra-indicated here as elsewhere, except for temporary service. One need scarcely add that if the defective union is due to the general condition of the patient, no amount of operating will make the fracture unite so long as that condition persists.

Nearthrosis, a very rare condition, in which the bone-ends are separated by a joint-cavity, demands operative interference.

Faulty or angular union may be remedied by osteotomy.

Special Fractures.

Fractures of the Skull.—VARIETIES.

—Instead of dividing these fractures, according to their location, into fractures of the vault and of the base, it is more intelligible to speak of

1. *Circumscribed fractures*, with little injury to the brain.

2. *Fissured fractures*, usually associated with serious brain-lesions.

3. *Intermediate and irregular fractures*—the intermediate fractures that combine some of the features of each of the above varieties.

Circumscribed fractures being usually caused by a sharp blow from some pointed object, the skull is crushed locally, without any great injury to the underlying parts. In typical cases, after the shock of the blow has passed off there is no further danger or inconvenience, except the danger of infection, for almost all fractures of the skull are compound. Sometimes the outer table alone, again (but rarely) the inner table alone, and usually the whole thickness of the skull is depressed. Yet there may be no depression, the skull being simply split (locally) at the point of fracture.

The *diagnosis* may be easily made by inspection and palpation. If, however, the fracture is not compound, a ridge of clotted blood may feel like the overhanging edge of the uninjured bone over a depression; but in the case of the clot the finger goes up one side of the ridge as well as down the other, and does not simply slide over the ridge, and firm pressure will indent the clot, but not the skull.

FISSURED FRACTURES.—These fractures are caused by the “binding” or “bursting” of the skull under pressure applied broadly. They are the “indirect” fractures of the skull, just as the circumscribed fractures are “direct.” Consequently fissured fractures are much more common in the base, and circumscribed fractures more common in the vault. The bursting force may make itself felt in a radial direction or in a direction at right angles to this, and the fissures are therefore usually dispersed in one of these two directions, although the irregular thickness and elasticity of the skull, especially its base, is liable to impart to the fissure a ziz-zag course. The fissure may occur only at some point quite distant from the point of impact and is there often termed a *contrecoup*, a misleading term, for there is no *contrecoup*. On the other hand, the fissure may be so extensive as to allow the two halves of the skull to be freely movable upon each other. Since the cause of those fractures is generally a blunt instrument, they are less often compounded than the circumscribed fractures.

These fissures being due to a bursting of the skull on account of a sudden change of shape of the whole globe, it is readily understood that the associated lacerations of and hæmorrhage into the contained structures are likely to be very extensive and to prove rapidly fatal, not in any sense on account of the fracture, but on account of the trauma that caused the fracture.

DIAGNOSIS.—Fissures in the vault are often compounded and thus readily diagnosed. Care must be taken not to mistake a lacerated aponeurosis for a fissure of the skull. In fissures of the base, however, the diagnosis can rarely be made except by inference. As these fis-

asures often involve the petrous portion of the temporal bone, rupturing the tympanum, hæmorrhage from the ear, mouth, or nose is a fairly-accurate diagnostic sign of fracture of the base. The diagnosis is, however, of very little importance.

INTERMEDIATE AND IRREGULAR FRACTURES.—Most fractures of the skull are, in a sense, intermediate between the two great divisions of circumscribed and fissured fractures, for with every sharp blow there is seen to be some compression of the whole globe, and even the bluntest force, if applied with sufficient momentum, will cause a local crushing. But an understanding of the two great classes will elucidate all such cases. Exceptionally the brain is compressed by the blood effused beneath a circumscribed fracture, and its evacuation is followed by immediate relief of symptoms; but, we repeat, such cases are exceptional.

PUNCTURES.—Those which cause a local fracture are very liable to produce a local brain-lesion and to lead to infection; hence they present special therapeutic indications.

RING FRACTURES around the foramen magnum are caused by a sudden blow upon the buttocks which forces the spine up into the skull, carrying a ring of the basilar portion of the occipital bone along with it.

PATHOLOGY.—A piece of depressed bone may lacerate both dura and pia and even the brain. In so doing it may tear the great sinuses or the middle meningeal artery. If the fracture involves the inner ear, the hearing may be permanently lost. Various nerves and vessels and the cord itself may be torn at their points of exit from the skull. Any amount of brain-laceration may accompany the fracture.

Process of Repair.—Most of the membrane-formation is done by the diploë, the osteopoeitic faculties of the pericranium and dura being very slight. Consequently there is very rarely any superabundant callus, and consequently, too, if a piece of skull is removed it will be replaced only by fibrous tissue, and not by bone.

PROGNOSIS.—The gravity of the prognosis depends on two things, either of which may exist without any fracture at all, namely: the damage to the brain and its adnexa, and infection. The importance of depressions of small areas of the vault has been unduly magnified. Stimson strongly advises against meddling with simple depressed fractures unless focal symptoms present themselves. It is certainly absurd to suppose that the depression of a square inch of bone to the depth of half an inch or so could cause the severe and lasting shock that is so often attributed to such an injury, nor should the elevation of such a splinter be expected to relieve these grave disorders.

TREATMENT.—*Simple Fractures.*—Attend to the general condition of the patient and leave the fracture alone unless focal symptoms present themselves as the result of a depression or a hæmorrhage from the middle meningeal artery. In such cases operate to elevate the depression or to stop the hæmorrhage. Many surgeons hold that all depressed fractures should be elevated at once. As the choice lies between the problematical danger from the existing depression and the real danger from possible infection, the question cannot be said to be definitely settled.

Compound Fractures.—Operate immediately for the purpose of cleansing the wound. Fill the wound itself with gauze wet in bichloride 1 to 10,000, then

shave and cleanse the whole scalp, or at least half of it. Next enlarge the skin-wound if necessary in order to catch all bleeding-points and to expose the laceration of the soft parts. If there is any depressed bone it can usually be elevated by prying up the most elevated corner and extracting this piece by gentle manipulation with the forceps, after which the rest will follow easily. Occasionally the chisel or trephine may be necessary; but in all compound fractures the bone must be elevated for the purpose of assuring the asepsis of the subjacent tissues. Having elevated and removed the splinters the whole wound is copiously irrigated with "normal" salt solution. If any intracranial hæmorrhage persists, the wound must be left packed with sterile or iodoform gauze for forty-eight hours, after which it may be closed. If there is no bleeding the dura is sutured; if torn, and the pericranium, aponeurosis, and skin sutured in layers, the first three with catgut, the last with silk. An aluminium, silver, or celluloid plate or a sheet of gold-foil or rubber tissue may be interposed in the gap left by the removal of fragments of bone in order to strengthen the scar.

If a fissure of the skull appears in the wound, it should be thoroughly cleansed as far as infection may have traveled, the wound being slightly enlarged and the edge of the fissure chiseled away for this purpose, if necessary. There is no object in endeavoring to find the limits of the fissure, which may extend half-way around the skull or even farther. If from the force of the blow a depression of the inner table seems possible, that is no indication for increasing the patient's risks of brain-infection by trephining. Such depressions are extremely rare, and unless they give rise to focal symptoms they are innocuous.

Punctured wounds should always be opened up, the punctured part of the skull being entirely removed by the trephine and the whole wound then irrigated and drained. Bullets located near the surface may be removed at once; if deeper and not to be touched by gentle probing, they had best be left alone, as their presence does not materially influence the prognosis. If they give rise to symptoms later, they may be located by the X-rays and their removal attempted with a greater prospect of success. Infection from the air-passages in fractures of the base cannot very well be guarded against. It is futile to render the middle ear aseptic when germs may constantly reach it through the Eustachian tube.

Fracture of the Vertebræ.

The importance of fractures of the vertebræ, like those of the skull, is dependent almost entirely on the amount of damage done to the inclosed nervous tissues; on this the symptoms, prognosis, and treatment depend.

SYMPTOMS.—The symptoms are mainly those of an injury to the spinal cord. If the displacement is such as to compress or tear the cord, paraplegia results, with loss of control over the vesical and anal sphincters, and in the male priapism usually occurs. Locally there is tenderness and pain, increased by motion, ecchymosis, and deformity, and crepitus in some cases.

DIAGNOSIS.—Except the deformity and crepitus, any or all of the above symptoms may be caused by injury to or disease of the cord without any fracture of the spine. Hence the diagnosis is generally obscure; but no manipulation should be undertaken for the purpose of elucidating it, for fear of precipitating a fatal issue. Fracture and dislocation are

usually associated, and their differentiation is of no clinical importance.

In estimating the location of the injury, it must be remembered that the pressure symptoms may be due as well to hæmorrhage or inflammation as to the displaced bone, and also that it may take twenty-four to forty-eight hours for the paralytic symptoms to appear at their distinctive level. Hence the local symptoms of pain, tenderness, and deformity are much better guides to the level of the lesion than the paralytic and anæsthetic symptoms.

ETIOLOGY.—Indirect violence by causing an excessive bending of the spine is the common cause of fracture. Such violence may be applied by a fall of the subject himself or by some heavy body falling upon him. Less frequently muscular violence produces a fracture of the spine, the usual location of such fractures being the cervical region and the usual cause a sudden jerking backward of the head: as to avoid striking the bottom when diving in shallow water.

PATHOLOGY.—The crushing force which causes the fracture is very likely to cause a simultaneous dislocation.

The bodies of the vertebræ are the parts most affected, except in the cervical region, where the transverse and articular processes are more frequently injured. Direct violence occasionally tears away the spinous process. There is no regularity about the fractures, however, every conceivable variety having been observed. The upper fragment is usually displaced forward on the lower one and the cord is compressed, rarely torn across, between the two. Subdural hæmorrhage or secondary meningitis may give rise to still further compression. The nerves that make their exit at that particular segment are usually torn, as are the attached muscles and ligaments.

PROGNOSIS.—*Fractures of the Lower Three Lumbar Vertebræ.*—In fractures of this region only the cauda equina is liable to compression, and its individual components can usually slip aside from any obtunding fragment, and thus there will be no pressure symptoms. Under appropriate treatment the bones unite and the patient may recover entirely or with a weak back, or with paralysis or pain from pressure in some of the nerves.

Fractures Above the Second Lumbar.—The prognosis as regards life and death varies with the amount of damage done to the cord. If the cord is permanently damaged, the patient may continue to live as long as two months, only to die finally of exhaustion or of septic infection from bed-sores or catheterization. Death may be instantaneous from shock or from involvement of the phrenic nerve in the laceration. In fractures high up in the cervical region, even of the atlas and axis, death is not always instantaneous, but the least movement or jolt may be enough to bring fatal pressure to bear on the cord.

TREATMENT.—In all manipulations the greatest care must be exercised to avoid the production of farther displacement. The patient must be kept upon a water-bed, catheterization must be conducted with every precaution, and the bladder irrigated daily with a saturated watery solution of boric acid, or, if cystitis supervenes, with a 1 to 4000 solution of nitrate of silver. Pressure must be taken off spots where bed-sores threaten, and, if they occur, they must be kept clean and dry by antiseptic powders. Nor must the patient's general vitality be neglected. As long as there is any hope of recovery electricity and massage to the paralyzed muscles are advantageous, and the strictest cleanliness

must be insisted upon. The curative measures are mechanical and operative.

Mechanical Treatment.—This originally consisted in traction upon the head and feet by two assistants while the surgeon endeavored to reduce the fracture by direct manipulation. More recently suspension and the application of a plaster jacket, as for Pott's disease, has afforded some good results, and a similar treatment is that of Dr. Woodbury's, who applied the jacket to a child upon whom traction was being made while it lay face down upon a hammock of cheese-cloth. Dr. Stimson advocates suspension along a plank, the plaster being applied while pressure is maintained on the protuberance.

Operation.—The so-called laminectomy is done through a long vertical incision with its centre over the fractured vertebræ. The bone is bared and the spinous processes of three or four of the vertebræ removed. Then with Rongeur forceps the laminæ are divided on either side as close as possible to the transverse processes. The dura is then exposed and if distended with pus or blood it is incised and drained. Otherwise it is gently retracted and the bodies of the vertebræ are palpated. Any unevenness in them is removed, the straightening of the whole column attempted, and the wound closed without drainage, unless hæmorrhage or suppuration demand it.

The results of operation have been so unsatisfactory even at the hands of its most earnest advocates, and the effect of traction and the plaster jacket so manifestly advantageous, that the mechanical method is the treatment of election even though operation has occasionally disclosed and remedied pathological conditions upon which no manipulation could have exercised a beneficial influence.

Fracture of Nasal Bones.—The nasal

bones, cartilages, and septum may each and all be fractured. Such fractures may be followed by tedious suppuration, facial emphysema, plugging of the lacrymal canal, and, as the displacement is always backward, some subsequent deformity is inevitable, unless they are replaced.

DIAGNOSIS.—By endeavoring to move the upper and lower parts of the nose laterally upon each other, false motion and crepitus will thus be elicited.

TREATMENT.—This must be begun promptly, for osseous union has been known to occur by the tenth day. By means of a director passed within the nostrils the bones are replaced. The only retentive apparatus of any value is a long pin passed directly through the nose and resting on either cheek, the nose being covered with a piece of adhesive plaster. As a general rule, however, there is no tendency to reproduction of the deformity, and, even if such a tendency does exist, frequent reposition will appeal to the patient rather than the transfixion treatment. In old unreduced fractures an artificial bridge of aluminium, celluloid, or gutta-percha may be introduced and is well borne.

Fracture of the Malar and Superior Maxillary Bones.—Fractures of these bones beyond the subsequent liability to suppuration and emphysema are of no particular importance. If a fracture of the zygoma threatens a serious deformity, it may be remedied by inserting a sharp hook under the process and so elevating it. Fractures of the alveolar process of the jaw with displacement should be treated by wiring the teeth, or by an interdental splint (*vide infra*).

Fractures of the Lower Jaw.—The body, the ramus, the condyle, or the coronoid process may be fractured. Fractures of the body are, by far, the

most common. They are almost always compound and occur usually in the middle line or else are double, one on each side. Unilateral fractures are comparatively infrequent. The displacement is usually vertical and from before backward, as well. It may be appreciated by the finger inside the mouth. In fractures of the ramus there is little or no displacement. In those of the condyle that process is usually drawn forward on to the eminentia articularis, the lower fragment slipping up into the glenoid cavity and so causing the chin to deviate to that side.

The diagnosis is easy except in fracture of the ramus, where local tenderness and pain on closing the jaws may be the only symptoms.

TREATMENT.—A mild antiseptic wash should be employed frequently to lessen the danger of infection and to clear the mouth of the foul and acid discharge from the wound. Under such treatment with efficient immobilization the wound may be expected to heal kindly, though occasionally it is impossible to prevent suppuration and necrosis.

IMMOBILIZATION.—Though reduction is easy, the deformity tends to reproduce itself, to overcome which tendency a great number of mechanical devices have been introduced. The principles employed are external pressure, exemplified by the four-tailed bandage (Fig. 2), wiring of the bone or teeth (several on either side lest they pull out), and the interdental splint. This is a piece of gutta-percha or vulcanized rubber molded to fit between the upper and lower teeth and of such width as to hold the jaws slightly separated so that fluids may be introduced through a hole bored in its centre. This is applied and the jaw bound firmly by a four-tailed bandage. The first two methods may prove

satisfactory; but the dental splint, though more complicated, is quite sure to give satisfaction if it is made by an expert dentist.

Fracture of the Hyoid Bone, the Larynx, and Trachea.—These rare fractures are usually caused by direct violence, as in strangulation. They may be recognized by direct palpation. They endanger life by obstructing respiration. If the symptoms are urgent, tracheotomy should precede attempts at reduction.

Fracture of the Sternum.—This accident is very rare. It is usually caused



Fig. 2.—Four-tailed bandage for fracture of lower jaw. (*Stimson.*)

by the strain of bending forward or backward. The symptoms and treatment are those of dislocation (*q. v.*).

Fractures of the Ribs.—These are frequent, though often multiple, and occur usually between the fifth and ninth. The upper and lower two ribs are almost never fractured. In single fractures there is, as a rule, no displacement; but multiple fractures may give an angular displacement, or, if sufficiently extensive, a caving in of the whole side of the chest. The fracture may be located by a localized point of tenderness (and

crepitus), which may be elicited by pressure on the shaft of the bone at a distance from the fracture. Crepitus may also sometimes be elicited by deep inspiration, which is painful. If the lung is pierced there may be cellular emphysema, hæmoptysis, and later a pneumothorax.

TREATMENT.—Displacement having been corrected, the bone is immobilized by strapping the chest with adhesive plaster. During expiration a strip of plaster two inches broad is applied, beginning over the sternum and following the curve of the ribs over the point of fracture, and around to the opposite axilla. If several ribs are broken they are covered from above downward by similar strips overlapping.

Fracture of the Costal Cartilages.—See DISLOCATIONS.

Fractures of the Clavicle.—They are very frequent in children, being caused by a fall upon the arm which in an adult would be more likely to dislocate the shoulder. They occur usually in the middle third of the bone, are not infrequently incomplete, but very rarely compound.

Fractures of the middle third are transverse or oblique, from above downward and inward. The shoulder, losing its anterior support, drops downward, inward, and forward, the posterior border of the scapula is raised outward and its lower angle rotated slightly upward and backward. If the fracture is oblique the outer fragment slips below and behind the inner one, whose edge is prominent under the skin. Transverse fracture may give rise to angular deformity, the angle pointing upward and backward. If the fracture is comminuted the small fragments are markedly displaced; if it is bilateral the weight of the two shoulders on the chest may cause urgent

dyspnœa (relieved by dorsal decubitus). Injuries to the great vessels, nerves, and lungs are rare complications. The arm can be moved forward or backward, but cannot be abducted on account of the pain rather than the muscular disability.

In fractures of the outer third the line of fracture is usually transverse and the displacement angular, with the apex backward. Disability and deformity are not great.

In fracture of the inner third the outer fragment passes below the inner one or is accompanied by it, producing angular deformity.

PROGNOSIS.—Union is almost certain to take place at the end of four weeks whether the fracture is immobilized or not. Some persistent displacement is the rule, especially in adults.

TREATMENT.—Reduction is effected by pushing the shoulder upward, outward, and backward. Manipulation of the arm or simple dorsal decubitus will effect this. To maintain perfect reduction dorsal decubitus with the head slightly raised and the forearm resting across the chest is usually essential. In the green-stick fractures of children a simple sling may be sufficient, and the same dressing may be applied to all patients who are impatient of restraint in the more complicated dressings and are willing to accept the subsequent deformity.

In other cases Sayre's or Velpeau's dressings will produce an æsthetically satisfactory result.

Sayre's dressing (Figs. 3 and 4) requires two strips of adhesive plaster, each three inches broad and long enough to reach one and a half times around the body. The end of one strip is fixed loosely about the arm on the injured side just below the axilla. It is then carried around the back and across the

chest in such a way as to hold the elbow a little behind the axillary line. The other strap is then carried from the uninjured shoulder across the back and the point of the elbow and back to the point of starting, carrying the elbow forward,

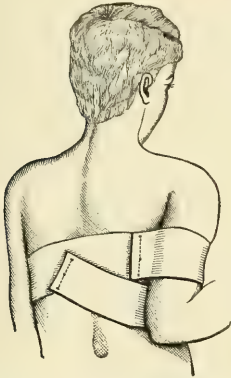


Fig. 3.—Sayre's adhesive-plaster dressing for fracture of clavicle. First piece.
(Stimson.)

upward, and inward. Thus the shoulder is carried upward, outward, and backward. The axilla and the whole inner surface of the arm and forearm should be well padded with cotton or wool, and the bony points of the elbow should be protected in like manner. The band had best be left uncovered and the whole dressing supported by a few turns of a roller bandage.

Velpeau's dressing, as shown in Fig. 5, holds the elbow pressed against the front of the chest. It is made with a roller bandage. Padding should be applied as noted above.

Moore's ingenious combination of a posterior figure-of-8 bandage to both shoulders and one elbow with a sling (Figs. 6 and 7) is effective, but uncon-

fortable, and unless carefully padded is likely to interfere with the circulation of the arms.

Fracture of the outer third is best immobilized by Stimson's dressing for dislocation of the outer end of the clavicle (*q. v.*).

To avoid deformity displaced comminuted fragments may be removed through a small incision.

Fractures of the scapula are divided into fractures of the body, of the lower angle, of the spine, of the acromion, of the coracoid process, of the surgical neck, and of the glenoid fossa.

FRACTURES OF THE BODY AND INFERIOR ANGLE may be partial or complete, simple or comminuted. When the angle is torn away it is drawn forward by the attached muscles and cannot be



Fig. 4.—Same as Fig. 3. Second piece.
(Stimson.)

replaced. In fractures of the body displacement is usually confined to overlapping of the fragments. The diagnosis is made in either case by palpation, and the sole treatment is immobilization by plaster strapping, as for fractures of the

ribs, and support of the arm by a sling. The only complication to be feared is suppuration in the deeper planes, which



Fig. 5.—Velpeau's dressing for fracture of the clavicle. (*Stimson.*)

may follow even a simple fracture if the contusion has been severe.

Fracture of the acromion may be

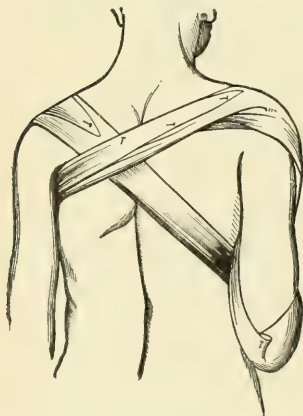


Fig. 6.—Moore's dressing for fractured clavicle. (*Stimson.*)

caused by external violence acting directly or through the humerus, or else by contraction of the deltoid. The

fracture is usually beyond the attachment of the clavicle. Non-union of the epiphysis may occur. Bony union can rarely be obtained, but no disability follows fibrous union.

Treatment.—Velpeau's dressing (Fig. 5).

FRACTURE OF THE CORACOID PROCESS may be caused by external violence or muscular action and is often complicated by other injuries. Abnormal mobility, with or without crepitus, may be ob-

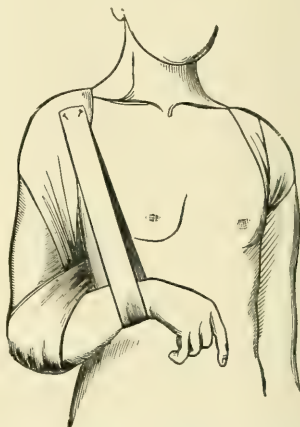


Fig. 7.—Moore's dressing for fractured clavicle. (*Stimson.*)

tained by pressure on the tip of the process. Fibrous union without disability is the rule.

Treatment.—Treatment is by immobilization of the arm in slight hyperextension.

FRACTURE OF THE SURGICAL NECK.—Either the whole of the glenoid fossa or only a part of it is torn off with the long head of the triceps attached to the fragment. The support of the triceps being lost, the whole shoulder sinks

downward and the displacement resembles very closely a subcoracoid dislocation. The arm, however, is not abducted nor is there any characteristic restriction of motion; a lump may be felt in the axilla, and the deformity may be reduced (with crepitus) by lifting the arm, but immediately recurs.

Treatment.—The treatment is as for dislocation of the outer end of the clavicle; bony union may be expected.

FRACTURE OF THE GLENOID FOSSA.—The rim is often broken, with dislocations of the shoulder-joint. Stellate fractures have been found post-mortem.

Fractures of the Humerus.—These may be conveniently grouped into fractures of the *upper extremity*, of the head, anatomical neck, through the tuberosities, of either tuberosity, of the surgical neck; and separation of the epiphysis, of the *shaft*, and of the *lower extremity*; supracondyloid, intracondyloid, of either condyle, or epicondyle; and separation of the epiphysis.

FRACTURE OF THE HEAD.—This is very rare, excepting the splitting that may accompany dislocation, and cannot be recognized clinically.

FRACTURES OF THE ANATOMICAL NECK AND THROUGH THE TUBEROSITIES.—These present the same clinical features and can rarely be differentiated before death; indeed, the line of fracture is likely to be so irregular as to be partly through the neck and partly through one or other tuberosity. These lower fractures are certainly more frequent than simple fractures of the anatomical neck. Most cases occur in connection with anterior dislocation. There may or may not be impaction. If the head is dislocated forward it may be felt, and its independent mobility recognized when the shaft of the bone is rotated. If the head is not dislocated, pain in up-

ward pressure on the elbow may be the only symptom.

Treatment.—If the head is not dislocated, treatment is by immobilization with slight traction. If it is dislocated, alternatives present themselves: The surgeon may maintain the two fragments in apposition, hoping to obtain union, and then at the end of five weeks to attempt reduction by manipulation, or, this failing, by operation. On the other hand, he may, and this seems the better plan, attempt reduction at once. If his manipulative efforts do not succeed, he may attempt operative reduction, laying bare the head, boring a hole in it, and then reducing it by means of a stout right-angled hook (McBurney) inserted into this hole. Failing in this, he may excise the head. In any case the area should be immobilized for five weeks. The theory that the head subsequently atrophies has no very good foundation in fact. On the contrary, very good functional results are obtainable.

FRACTURES OF THE TUBEROSITIES occur in connection with dislocation of the shoulder forward (greater tuberosity) or upward (lesser tuberosity). As the fracture is often incomplete, bony union without much deformity is the usual result.

SEPARATION OF THE EPIPHYSIS may occur at any time during the first two decades of life. The most common mechanism of its production is probably hyperabduction in the efforts to pull down the arm during labor. The line of separation runs just below the tuberosities and the usual displacement is of the lower fragment more or less completely to the inner side and in front of the upper one, which is tilted outward. The edge of the lower fragment may be felt or even seem close under the skin in front. Crepitus is slight, owing to the cartilaginous nature of the edges. Re-

duction is by manipulation or by forced abduction, which brings the lower fragment in line with the upper one. Union may be irregular if the periosteum slips between the fragments. Immobilization must be maintained for five weeks. Persistent displacement or premature ossification of the epiphysial cartilage may arrest the growth of the limb.

FRACTURE OF THE SURGICAL NECK is by far the most common of the fractures of the upper extremity of the humerus. Under this head are classed all fractures between the line of the epiphysial junctures and the insertion of the pectoralis and teres major. They are caused by direct violence or a fall upon the elbow. The displacement is usually slight, but the lower fragment may be drawn up and to the inner side of the upper one, which is then held in abduction. The diagnosis is made by eliciting abnormal mobility and crepitus when the tuberosities of the humerus are firmly grasped and the arm gently rotated. In impacted fractures there is a tender spot just below the tuberosities and the arm is usually held in slight abduction.

Treatment.—If there is much overriding, reduction can only be effected by traction in extreme abduction. If the fragments are impacted in fair position, or if there is no displacement, as is often the case, any immobilizing dressing will be sufficient. Usually, though, there is some tendency to shortening to be overcome by traction and often some abduction in the upper fragment that cannot be overcome. To meet these indications various splints have been devised. For abduction of the upper fragment the best treatment is generally to keep the patient in bed and traction by weight and pulley (see **FRACTURES OF THE THIGH**) on the arm held in partial abduction by

being bandaged on a triangular pad or a bent metal band fitted into the axilla. After two weeks sufficiently firm union will probably have taken place for the arm to be abducted. In this position it is maintained for three or four weeks longer, by a plaster mold or circular splint of which the upper edge is molded well over the shoulder to immobilize the joint and which is made light over the forearm (the elbow being bent to a right angle) and heavy over the arm. The whole is bound lightly to the chest and the wrist above supported by a sling, in order that the weight of the arm may tend to prevent shortening. Any shortening that may occur will be indicated by a rising of the shoulder-cap and must be compensated by weights attached to the elbow. During all this time frequent exercise of the wrist and fingers must be insisted upon.

A variation of the above line of treatment should be effective in any case. Ambulatory treatment with the arm in abduction is possible, but irksome.

A simultaneous dislocation of the head is treated as above indicated.

FRACTURES OF THE SHAFT.—These are caused by external violence or by muscular action. All varieties of fractures and displacements are seen here. The vessels or nerves may be injured, notably the musculo-spiral, which may be torn across, pressed upon by the callosus, or caught between the fragments. Union is more likely to fail in this than in any other bone: a fact that has been explained by deficiency of immobilization, for, since the hand is supported by a sling, every motion of the head and neck imparts a slight movement to the fragments.

The treatment is along the same lines as that of the surgical neck. Shorten-

ing must be carefully watched for and prevented.

SUPRACONDYLAR FRACTURE.—The line of fracture passes through the lower part of the humerus, just above the condyles. The joint is usually not involved, but may be opened by an additional intercondylar fracture or fracture of the olecranon. The line of fracture is usually from behind downward and forward, and consequently the lower fragment is displaced upward and backward. The sharp point of the upper fragment may pierce the skin in front; more rarely the fracture is compound from behind by the lower one. If the swelling is not too great the displacement can be seen as well as felt, and false motion and crepitus elicited by moving the condyles on the shaft. Dislocation is ruled out by the normal relation of the olecranon and epicondyles, as compared with the other arm, and intercondyloid fracture by the absence of its typical symptoms (*q. v.*).

Treatment.—Same as for fractures of the lower part of the shaft: immobilization with the elbow flexed at a right angle and the forearm in semipronation. A sufficient weight, usually five pounds, should be suspended at the elbow to prevent shortening, and the *hand alone* suspended in a sling. Suspension of the whole forearm gives rise to angular deformity with adduction of the forearm.

Treatment by extension may be advantageously combined with suspension of the limb in a vertical position for the first fortnight of treatment of a compound fracture; but as this position tends to tilt back the lower fragment it should never be employed except as just mentioned and then only for the advantages of elevation in the healing of the wound.

INTERCONDYLOID FRACTURE (T- OR Y-FRACTURE).—This differs pathologi-

cally from a supracondylar fracture only in the additional line of fracture separating the condyles. The additional force usually required to produce such a fracture is such that the displacements are varied and likely to be marked, and the fracture is often compound and associated with injuries of the adjacent vessels and nerves. In doubtful cases the characteristic symptoms to be sought for are mobility of the condyles upon each other, usually with crepitus, and, in still more obscure cases with no displacement, simple tenderness when the two condyles are pressed against each other.

The treatment is that of supracondylar fracture with additional care in the immobilization of the fragments. Anterior and posterior plaster splints are usually satisfactory. In compound fractures, where the joint is widely laid open, Kocher advises the removal of the external condyle to facilitate drainage and to produce a fairly strong and movable joint. In some cases it may be necessary to remove both condyles with the risk of substituting a flail joint for an ankylosed one. In all compound fractures the fragments should, of course, be retained in place by suture or temporary pegging with a nail or drill.

FRACTURE OF THE EPITROCHLEA, OR INTERNAL EPICONDYLE.—This occurs in connection with dislocation of the elbow or as the result of direct violence. The fragment is left more or less closely attached to the condyle and its mobility may be readily recognized. Paralysis and neuralgia from pressure on the ulnar nerve have been known to follow this fracture. A spontaneous cure may generally be expected.

Treatment.—Direct pressure with immobilization of the forearm in flexion to relax the attached muscles. Two or three weeks' treatment suffices.

FRACTURE OF THE EXTERNAL EPICONDYLE.—This is caused by direct violence and is extremely rare. The mobile fragment is easily recognized and immobilized.

FRACTURE OF THE INTERNAL CONDYLE.—This is caused by indirect violence through forcing upward the condyle with the ulna attached to it. The line of fracture runs from the inner side of the humerus downward and outward to the centre of the trochanter or between it and the capitellum. Ligamentous attachment to the ulna usually prevents any marked displacement, and the swelling all about the joints usually obscures such displacement as there is. The forearm is adducted, however, and abnormal adduction and abduction are possible at the elbow. (These movements can only be distinguished from rotation of the humerus when the joint is in full extension: a position but rarely obtainable except under anæsthesia.) Independent mobility of the fragment and tenderness on transcondylar pressure should be sought for. Coincident dislocation of the radius backward from the external condyle leaves that part of the humerus prominent anteriorly (see DISLOCATIONS). Unless such dislocation is present, the altered relations of the epicondyles and olecranon are likely to be distinguishable through the swelling.

The treatment is by immobilization in the usual semiflexed position. The positions of extreme flexion or extension which have been advocated are inconvenient and present no advantages. If the fragment will not remain in place, it must be cut down upon and fixed by suture. Angular deformity is liable to ensue from suspension of the elbow, as in supracondylar fracture, and may occasionally follow premature ossification of

the epiphysial cartilage after fracture of the internal condyle in the adolescent. Excessive formation of callus is likely to impair the functions of the joint, especially in the young.

FRACTURE OF THE EXTERNAL CONDYLE.—The fragment consists of the external condyle, the capitellum, and part of the trochlea. The symptoms are the same, *mutatis mutandis*, as those of fracture of the internal condyle, but the disability is usually less. As more or less rotation of the fragment is liable to occur, the most difficult part of the treatment is reduction, for which an operation may be necessary. Under such circumstances Kocher has excised the condyle, with good results. After reduction has been accomplished there is little difficulty in retaining the fragment in place, and three weeks in a posterior molded splint with the joint at midflexion suffices for a cure. Excessive callus may interfere with the function of the joint.

SEPARATION OF THE EPIPHYSIS.—This accident is very rare. The epicondyles may or may not remain attached to the upper fragments. The chief symptoms are pain on pressure of the forearm against the arm, abnormal mobility, and cartilaginous crepitus. The treatment is the same as that of supracondylar fracture.

SUBEPICONDYLAR FRACTURES.—These usually involve both trochlea and capitellum, very rarely the trochlea alone. If there is no deformity, the fracture may be trusted to heal under immobilization. But if there is persistent displacement the fragment or fragments should be excised. The fluoroscope may be of great assistance in diagnosing obscure lesions about the elbow-joint, but most cases can be diagnosed and treated without its aid.

AFTER-TREATMENT OF FRACTURES ABOUT THE ELBOW.—After the three or four weeks that are necessary to obtain union of the fracture, the elbow will be found quite stiff. If this stiffness is due solely to adhesion and capsular retraction, it may be expected to disappear after some weeks of natural use of the limb. Excessive callus, too, will diminish rapidly, and it is doubtful whether any treatment will hasten its absorption. Forcing of the joint is harmful, as a rule, and if convalescence is too slow elastic traction to increase flexion and a weight on the hand to increase extension may hasten matters a little by supplementing the patient's own efforts. Osteotomy or arthrotomy may be resorted to after several months have elapsed; but the more conservative the treatment, the better will be the results.

Fractures of the Radius and Ulna.—

FRACTURE OF THE OLECRANON.—This may be at the tip or near the base. The mechanism is usually indirect violence combined with the action of the triceps, the olecranon being broken across the trochlea as a stick would be across one's knee. Aponeurotic and periosteal lacerations are usually slight, and consequently there is little or no displacement. The mobility of the fragment is readily recognized.

Treatment.—If the displacement is slight, and is not increased by flexion the elbow may be immobilized midway between full extension and flexion at a right angle. In other cases the elbow must be retained in full extension, and it may even be necessary to pull the olecranon down. The simplest method of traction is by a narrow strip of adhesive plaster running up the side of the forearm over the upper border of the olecranon and down the other side. Maligne's patellar hooks and a figure-of-8

bandage have also been employed. An anterior molded splint gives satisfactory immobilization and permits observation of the displacement. Union is likely to be fibrous, and, in those cases in which this greatly impairs the use of the limb, the fracture may be freshened and sutured.

FRACTURE OF THE CORONOID PROCESS is extremely rare except as a complication of dislocation. As the brachialis anticus and capsule are attached to the bone below the process, its displacement is slight and it unites kindly under immobilization at a right angle (to prevent recurrence of the dislocation).

FRACTURE OF THE HEAD AND NECK OF THE RADIUS is usually associated with the last-mentioned lesion as a complication of backward dislocation of the elbow. If the fracture can be clearly made out the fragments should be removed, for they are likely by their malunion to interfere with supination; but if the diagnosis is not certain the operation may safely be postponed until it is demanded by impairment of function. Only one case is reported of fracture of the neck of the radius alone.

FRACTURES OF THE SHAFT OF ONE OR BOTH BONES.—Fracture is usually in the middle or lower third of the forearm, and the radius is usually fractured at a higher level than the ulna. Fracture of a single bone is most frequently due to direct fracture of both bones to indirect violence. Green-stick fractures are more common in the radius than in any other bone. Displacement in any direction may occur, and, if unreduced, is of special importance as affecting the rotation of the forearm. A peculiar displacement is that of supination of the upper fragment of the radius by the biceps when the bone is broken above the insertion of the pronator teres. According to

most authors, unless the limb, in such case, is immobilized in extreme supination a permanent loss of that motion will result. Practically, however, the impairment to supination when the limb is kept in the usual semipronated position is unimportant. Of far greater importance is the total loss or rotation that follows fusion of the two bones even when a lateral enarthrosis appears in the callus, as is rarely the case. The points that favor such a fusion are: (1) persistent displacement of the bones toward each other, (2) excessive callus from insufficient immobilization or imperfect reduction, and (3) the rare occurrence of fracture in both the bones at the same level.

In fractures of a single bone the displacement is usually slight, and the diagnosis may be difficult. A point of local tenderness may be found with either crepitus, false motion, or irregularity of the surface of the bone. In fractures of the ulna alone the head of the radius is often dislocated forward and upward.

TREATMENT.—Reduction by traction and local pressure, special attention being paid to the correction of any displacement of the bones toward each other, forcing them apart by deep pressure with the finger-tips on the front and back of the forearm. Green-stick fractures must be reduced by forcible bending, even completing the fracture, if necessary. *Circular constriction* of the limb should *never* be applied, for this is a most fruitful source of gangrene. The best splint is made of two well-padded boards a little broader than the forearm, the anterior one to extend from the elbow to the roots of the fingers (a roller bandage in the palm will prove grateful) and the posterior one from elbow to wrist. These are retained snugly

by adhesive plaster strips, thus forcing the muscles between the bones. Angular deformity is avoided by slinging, not the forearm alone, not the hand alone, but both, comfortably and in the same palm. Such a sling also immobilizes the elbow: an essential to the treatment. Pressure of the anterior splint on the brachial artery at the elbow and pressure on the bony points must be avoided. At the end of two or three weeks a plaster splint may be substituted for the wooden one, and in any case daily exercise of the fingers must be insisted on after the tenth day. Firm union should occur in a month, but delayed union is quite frequent.

FRACTURE OF THE LOWER END OF THE RADIUS (COLLES'S FRACTURE).—This is, after fracture of the ribs, the commonest of all fractures. It is generally produced by a fall upon the palm of the hand. The line of fracture runs irregularly across the bone within an inch of its articular edge. In the young it commonly follows the epiphysial line. The lower fragment is tilted back and impacted. It may be comminuted. The upward displacement is not great, but the tilting and crushing carry the styloid process of the radius to a higher level than that of the ulna, which is made prominent by the shifting over of the carpus. The periosteum on the back of the radius remains untornd. The styloid process or shaft of the ulna may be broken. Rarely the internal lateral ligament is torn.

The characteristic symptoms are the so-called "silver-fork" deformity, a backward displacement of the whole hand and the lower end of the radius, producing a swelling over the back of the wrist and a deep crease in the front. The styloid process of the ulna is prominent and lower than that of the radius. Crepitus

and mobility are usually absent. There is a line of tenderness along the line of fracture.

The diagnosis from dislocation is given under that heading.

Treatment.—The simplest way to break up the impaction is for the surgeon to grasp the forearm firmly just above the fracture. With the other hand he then grasps the injured hand, placing his thumb lightly on the back of the lower fragment. Dorsal flexion is made until the patient complains of pain, and then with a sudden movement the dorsal flexion is increased and simultaneously strong pressure is made on the lower fragment. In a moment the fracture begins to give, the dorsal is quickly exchanged for palmar flexion, the wrist being pried backward, and the resultant crepitus announces the dissolution of the impaction. Inspection should then show that the "silver-fork" deformity has disappeared. The impaction once thoroughly broken up, the bones tend to remain reduced, and should be immobilized by anterior and posterior wooden splints, which need not extend so far up the forearm as for fractures of the shaft (*q. v.*). Massage is very useful to shorten the convalescence and can best be used if, instead of wooden splints, molded plaster ones are used, extending from the middle of the forearm to the metacarpophalangeal joint both in front and behind. The hand is most comfortable in slight dorsal flexion. Its position bears no particular reference to that of the fragments. A simple band of adhesive plaster around the wrist is said to decrease the prominence of the ulna, and, indeed, seems to be the only splint necessary in some few cases. The fingers must be exercised after the tenth day.

OTHER FRACTURES NEAR THE WRIST.

—Cases have been recorded of reversed

Colles's fracture from a fall on the back of the hand. The lower end, or styloid process, of the ulna may be fractured alone. The so-called Barton fracture of the anterior or posterior lip of the articular surface of the radius is merely incident to dislocation of the carpus (*q. v.*).

Fractures of the carpus are very rare and usually compound.

METACARPAL FRACTURES usually occur in the third and fourth bone and are caused by direct or indirect violence. The injury is readily recognized. The tendency to displacement is slight. A favorite splint is made by fastening the hand over a soft ball by means of a strip of adhesive plaster. An anterior splint well padded up in the palm serves equally well.

Phalangeal fractures are usually compound. The hand may be bound over a roller bandage by means of several strips of adhesive plaster, one for each finger. Straight posterior splints may also be used.

Fractures of the pelvis may be grouped under seven heads:—

FRACTURES OF THE RING.—Under this title are grouped all fractures that dissolve the continuity of the pelvic ring. Such fractures must, of necessity, be vertical in the main. They are usually caused by a crushing from before backward. The line of fracture usually runs through the upper (just internal to the pectineal eminence) and lower (near its junction to the ischium) rami of the pubic bone. Such a fracture may be bilateral, and associated with a vertical fracture of the sacrum, a separation of the sacro-iliac synchondrosis, or a fracture through the ilium behind the acetabulum. These are the double vertical fractures of the pelvis. This double fracture may also occur from a fall on the foot, or the same cause may dislocate

the os innominatum at both symphyses. Or it may cause a radiating fracture of the acetabulum with or without penetration of the femoral head through the bone. Fractures of the ring are usually comminuted. Displacement of small fragments or a general mobility, with crepitus, of the whole pelvis may often be recognized. In double vertical fracture the fractured bone is often tilted; so that the superior strait is widened, the inferior strait narrowed, and the limb apparently shortened. Complications are usual and severe. Rupture of the membranous or prostatic urethra is almost inevitable, and the other common injuries are rupture of the pelvic vessels, the rectum, the bladder, and the ureters.

Treatment.—The associated injuries demand immediate attention. For the fracture itself rest in bed with even compression all around the pelvis is all that can be done, except in cases of tilting of the os innominatum, in which traction should be made as after fracture of the thigh.

TRANSVERSE FRACTURE OF THE SACRUM results from direct violence. The angular displacement forward may be corrected by pressure from within the bowel. A tendency to recurrence has been prevented by the adaptation of the urethral striated cannula to the rectum.

COCYGEAL FRACTURE resembles dislocation. It is rarely observed.

FRACTURES OF THE ILIUM are comparatively frequent and the result of direct violence. The crest of the various spinous processes may be broken. The treatment is rest in bed.

FRACTURES OF THE ISCHIUM in any of its parts is rare, as is

FRACTURE OF THE PUBES not extending across both rami.

FRACTURE OF THE ACETABULUM.—Fracture of the rim may complicate dis-

location of the hip and may be so extensive as to favor recurrence. Stellate fracture may be indicated by pain on pressure through the thigh. If the head of the femur has perforated the acetabulum it should be replaced by traction.

Fractures of the Femur.

FRACTURE OF THE NECK OF THE FEMUR.—The division of these fractures into intracapsular and extracapsular has no clinical value and is not borne out by post-mortem findings. The more accurate classification is: (1) fractures through the (narrow part of the) neck, and (2) fractures at the base of the neck. Clinically, it is often impossible and never necessary to distinguish between the two.

Symptoms.—The chief deformity is shortening of the limb with eversion. The eversion is usually slight, often absent, and rarely exchanged for inversion. The shortening may appear at once or may only come on gradually. In the latter case, under appropriate treatment the shortening may never appear at all. In measuring for shortening the greatest care must be taken to compare the limbs when placed in exactly similar positions. There is also a fullness in the outer part of Scarpa's triangle, and the fascia lata above the great trochanter is relaxed, as compared with the other side, on account of the elevation of the trochanter. Normally the upper border of the great trochanter just touches Nélaton's line drawn from the anterior superior spine of the ilium to the tuberosity of the ischium (*A-B*, Fig. 8). In fracture of the neck, with shortening, the trochanter rises above this line, and the amount of displacement may be measured by means of Bryant's ilio-femoral triangle, variations in the length of the line *C-D* (which is at right angles to *A-C*, a perpendicular dropped from the anterior superior spine of the ilium) indicating the displacement

of the trochanter. If the trochanter is split, it is broadened in comparison with its fellow.

Crepitus can rarely be obtained. Pain may be diffuse, but pressure over the neck of the femur is likely to be painful, as is upward pressure of the femur. A few cases are reported in which the patient has walked on the limb, but usually loss of function is complete and all the movements of the joint restricted.

The history of a typical case is as follows: An elderly person, preferably a woman, while walking about, stumbles and falls to the floor, with perhaps little violence. She cannot rise, and complains that every movement of the hip is painful. Examination will reveal symptoms as indicated above.

Diagnosis.—The diagnosis between the fractures through the neck and those at the base is often impossible. Splitting of the trochanter is a sure sign of the latter, while after the former it is believed that shortening is more likely to be secondary.

In dislocation the motions of the limb are restricted in certain definite directions and the head can be felt while in the usual dorsal dislocation; the emptiness of the acetabulum may be determined by pressure on Scarpa's triangle.

In subtrochanteric fractures the trochanter does not share in gentle rotation imparted to the shaft.

In old persons it is not rarely an absolute impossibility to differentiate contusion of the hip from fracture of the neck of the femur. In such a case, when the sole symptoms are pain and disability, treatment for fracture should be instituted without the slightest hesitation, the patient being bedridden in any event, and this treatment should be continued for at least three weeks and until all pain and soreness have disappeared. Thus, if

it turns out to be a contused hip, the patient has not been unduly inconvenienced, while if it be a fracture, he has been given the best chances of recovery and the surgeon has, perhaps, avoided a suit for malpractice.

Etiology.—As has already been indicated, fractures of the neck of the femur is usually caused by a comparatively slight injury to an old person, usually a woman. In the young a much greater amount of violence is required to break the bone.

Pathology.—In fractures through the neck the cancellous tissue is crushed, but impaction is rare. The head of the bone may be splintered. As a portion of the periosteum habitually remains un-

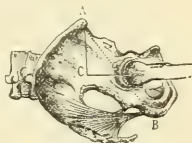


Fig. 8.—A-C-D, Bryant ilio-femoral triangle. A-B, Nelaton's line. (Owen, "American Text-book of Surgery.")

torn, the vitality of the head is insured thereby, and union, fibrous at least, may be expected. Fractures at the base are likely to be impacted and the line of fracture may split the great trochanter. The greatest impaction is usually behind; hence the thigh tends to rotate outward. The callus is often excessive.

Prognosis.—The prognosis, even as regards life, is far from cheering. The aged and feeble patient is liable to pass into a cachectic or demented state and thus to fade away, often with hypostatic pneumonia.

Or he may die in a few days by the shock. After he has passed the third week, however, the prognosis is good.

As to union, it may be fibrous or fail entirely, such a result entailing in some cases no disability to speak of beyond the inconvenience of a shortened limb, while in others locomotion may be entirely lost.

Treatment.—The first indication is

Energetic manipulations either for the purpose of eliciting crepitus or correcting deformity have a tendency to tear the periosteum still farther and to separate impacted fragments. Such shortening or eversion as cannot be overcome by the traction splint is best left uncor-

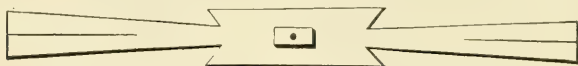


Fig. 9.—Adhesive plaster cut for Buck's extension. (*Stimson.*)

to save the patient's life, and to this all else must be subordinate. Such splints should be applied as will most promote the patient's comfort, and the disturbance of repeated measurement and redressing avoided. Careful nursing, feed-

ing, and stimulating are of capital importance. Premonitory signs of dementia must be watched for, and if the patient seems to be failing he must be gotten out of bed, whether his thigh has united or not. In this event the hip



Fig. 10.—Adhesive plaster folded for Buck's extension. (*Stimson.*)

ing, and stimulating are of capital importance. Premonitory signs of dementia must be watched for, and if the patient seems to be failing he must be gotten out of bed, whether his thigh has united or not. In this event the hip

ting accurate examination and measurement without disturbing the dressing; but Hodgen's is more convenient for the patient, and should be preferred for the aged.

In Buck's extension the traction is

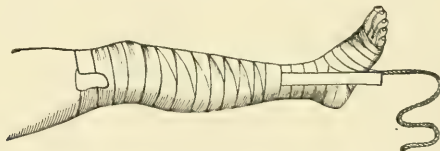


Fig. 11.—Adhesive plaster applied for extension. (*Stimson.*)

should be disturbed as little as possible and the patient allowed to recline in a wheel-chair. Pressure over the trochanter will encourage union, the pressure to be made by a pad under a pelvic band worn as tight as is compatible with the patient's comfort.

made by weight and pulley over the foot of the bed, which may be raised for counter-extension. It is applied as follows: A strip of stout adhesive plaster (the so-called "moleskin-diachylon" plaster, although it is rather difficult to apply, requiring to be heated before it will adhere,

—and if overheated it will blister the skin,—is least irritating), four inches wide and long enough to reach from well above the knee loosely around the sole of the foot and back above the knee again, is cut as shown in Fig. 9, and a small perforated block of wood placed at its centre. Through the hole in the wood and a corresponding one in the plaster a cord is passed, so knotted at the end that it cannot slip through. The edges of the plaster are now turned down over the

vented by employing Volkmann's sliding rest (Fig. 12), and sand-bags along the outer side of the thigh.

Hodgen's splint (Fig. 13) consists of two iron rods slightly bent at the connection of their upper and middle thirds and attached together by a straight bar at the lower ends and a curved one at the upper. The limb being attired as for Buck's extension (Fig. 11) the cord is attached to the straight cross-bar and a number of narrow compresses or pieces

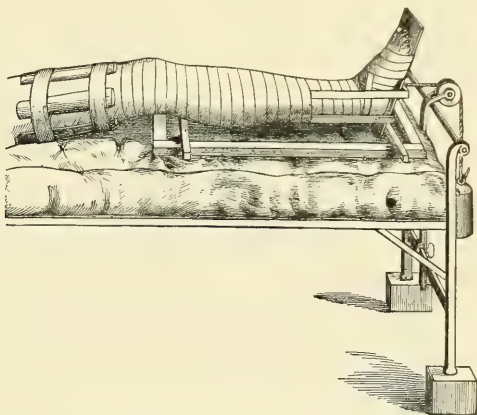


Fig. 12.—Volkmann's sliding rest for fracture of the thigh. (*American Text-book of Surgery.*)

block and each other (Fig. 10). A roller bandage (preferably of flannel) is applied to the foot and lower third of the leg, the adhesive plaster applied to the sides of the leg and thigh above it, and the bandage continued up over the plaster (Fig. 11). The cord is then carried over the pulley at the foot of the bed and attached to a weight of from 5 to 20 pounds, the heavier weights only being applied to robust and young patients whose shortening is not done away with by the lighter ones. Outward rotation is pre-

vented by employing Volkmann's sliding rest (Fig. 12), and sand-bags along the outer side of the thigh. The apparatus is supported by two loops tied to a cord which is attached to a crane at a point at least four feet above the bed and at an angle of about ten degrees from the vertical.

Traction hip-splints, such as are used in hip-joint disease, have also been applied here. Their use is certainly a great convenience and will doubtless be more

frequent in future. Unfortunately, however, they cannot be used by the very ones who need them most—the aged and infirm.

When the shortening has once been reduced some surgeons prefer to apply a plaster splint from waist to ankle at once. With such a splint pressure may be made over the trochanter through a fenestra to encourage union.

Excision of the head for non-union has been done with varying success, but

fracture of the neck, to which are added independent mobility of the trochanter and a prominent tender spot in front of it.

Treatment.—Hodgen's splint.

FRACTURE OF THE SHAFT.—Under this head may be included both "subtrochanteric" and "supracondylar" fractures. The line of fracture is usually oblique and there is both overriding and angular deformity. As the line of fracture usually runs downward and forward the

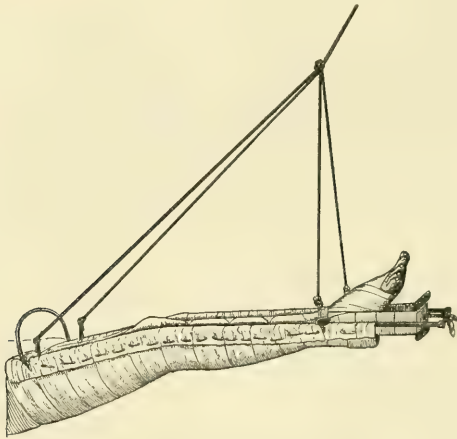


Fig. 13.—Hodgen's splint. (*American Text-book of Surgery.*)

should not be attempted until the failure of a prolonged course of treatment by ambulatory traction, combined with firm pressure over the trochanter (Schaefer), has shown that union is impossible.

FRACTURES OF THE GREAT TROCHANTER.—The trochanter alone may be separated by direct violence, or the line of fracture may pass through the neck above the lesser trochanter and thence through the lower part of the great trochanter. In such cases there are the usual signs of

angle is made by the posterior fragments being drawn up behind it. The upper fragment is often rotated outward. In fractures of the upper third the upper fragment is usually abducted. In those of the lower third its sharp point is liable to pierce the quadriceps and even the skin. The shortening may be determined by measurement, the abnormal mobility by gently elevating the limb beneath the point of fracture. The trochanter is not displaced upward. A com-

plicating synovitis of the knee is common, laceration of the great vessels rare.

Prognosis.—Shortening of about an inch should be expected.

Treatment.—Reduction is to be made gently. In fractures of the lower third if the upper fragment has pierced the quadriceps and cannot be disengaged by traction with the knee and hip strongly flexed, reduction must be made through a free incision.

Immobilization is best made by Hodgen's splint, which, while it does not immobilize quite as fully as Buck's, permits much more liberty to the patient, and can be adjusted in such a position as to avoid deformity more surely, namely: flexion and abduction of the hip for high

in a plaster splint should be beneficial, but great care must be taken to avoid angular deformity.

Ambulatory treatment as for fractures of the neck of the femur has proved satisfactory. Children under 10 are best treated by vertical suspension of both legs. The pelvis should rest lightly on the bed, thus making counter-extension.

For compound fractures the double-inclined plane (Fig. 14) is often most convenient. It affords no traction, but the loss of bone-substance by comminution usually renders traction unnecessary. In other cases Smith's anterior splint, which acts like a suspended double-inclined plane, is more appropriate.

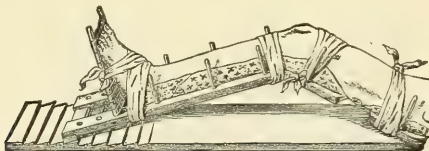


Fig. 14.—Esmarch's double-inclined plane. (*Esmarch and Kowalzig.*)

fractures and flexion of the knee for low ones. With Buck's extension it is particularly essential that the bed should be made flat by a "fracture-board" placed under the mattress. If the fracture is near the centre of the shaft coaptation splints may be used with advantage. In England a long side-splint with traction is a favorite dressing. It is very inconvenient. The tendency to outward rotation in the upper fragment is best opposed by a hard cushion under the great trochanter. Traction should be maintained for six weeks, the patient being kept under constant observation. Then he should be kept on crutches with a plaster-of-Paris splint from waist to ankle for about three weeks longer. If union is fibrous the irritation of walking

FRACTURES OF THE LOWER END OF THE FEMUR.—Epiphysiolysis is more frequent here than at any other point. It occurs as late as the twentieth year, usually from torsion or hyperextension of the leg. Associated injury to the vessels is common. The treatment is the same as for fractures of the shaft.

Fracture of one condyle is usually due to direct violence. Immobilization should be made with the knee extended.

Intercondyloid fracture presents the same features as intercondyloid fracture of the humerus.

TREATMENT.—Any fracture of the femur involving the knee-joint should be immobilized in extension. A molded posterior splint and slight traction will usually prove satisfactory as far as the

fracture is concerned; but the chief dangers are gangrene from injury to the popliteal vessels, and ankylosis or supuration in the knee-joint. Some subsequent stiffness in the knee is always to be anticipated.

Fracture of the Patella.—This is common between the ages of 20 and 50. It may be comminuted when due to direct violence. Rarely it is vertical. Ordinarily it is transverse and due to muscular action, as in jumping or avoiding a fall. The sudden pull of the quadriceps snaps the bone. The snap and a sharp pain are felt by the patient, and extension of the leg is almost completely

is still farther impaired by adhesions between the upper fragment and the femur and by the loss of coaptation between the patella and the condyles.

TREATMENT.—Non-operative treatment consists in causing the absorption of the fluid in the joint by pressure (massage is of little service) and then immobilizing the fragments until union has taken place. A Martin bandage should be applied with as much pressure as the patient can bear for four to six days, and may be continued for a fortnight if it holds the fragments in good position. During this time the patient is kept in bed with the knee extended.

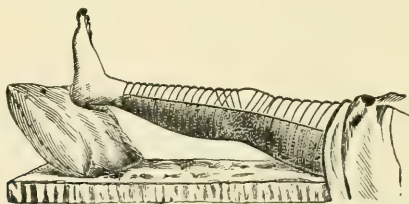


Fig. 15.—Hamilton's dressing for fracture of the patella. The final turns of the roller in front of the knee are not shown in cut. (*American Text-book of Surgery.*)

lost. The gap between the fragments is readily palpable, but is usually small at first, for the lateral ligamentous attachments of the upper fragment prevent the quadriceps from drawing it up the thigh. The joint becomes distended with effused blood. The periosteum over the patella is torn irregularly and a fringe of it drops between the fragments.

PROGNOSIS.—In the absence of treatment or from its inefficient application the two fragments will be drawn farther apart by the retraction of both the ligamentum patellæ and the quadriceps. Adhesions from organized blood-clot and lacerated ligaments immobilize the joint more or less completely, and extension

A posterior molded splint is then applied from the ankle to near the hip and is bandaged in place as shown in Fig. 15, the turns of the bandage about the knee pressing the tissues above and below the fragments toward each other,—these may be reinforced by strips of adhesive plaster,—and finally a few turns are taken over the fracture to prevent tilting forward of the fragments. The dressing must be worn for a month and frequently inspected and altered if necessary. At the end of this time an immobilizing plaster bandage is applied, and the patient allowed to go about on crutches. This splint must be worn for a month, not that union will become

much firmer, but so as to accustom the patient to walking about, and to loosen the adhesions a little, that the bone may not be refractured by another fall or slip. During this time massage may prove useful, and to that end the splint may be split anteriorly, removed daily, the limb massaged, and the splint replaced and held firmly by a roller bandage. At the end of the second month the patient is discharged, but advised to walk with care. Various splints have been devised to secure immobilization of the knee and coaptation of the fragments, but they present no advantages over the above method. A plaster bandage should never be applied until union has taken place. Malgaigne's hooks and their various modifications have had great vogue. The principle involved is the holding of the fragments in apposition by means of sharp hooks, which may be inserted into the upper and lower edges of the bone and drawn together by a screw. The danger in their use is that suppuration provoked at the points of puncture may travel into the joint either through the lymphatics or the cellular plains, especially if there is much effusion of blood. Finally, aspiration has been used—with strictest asepsis—to empty the joint more rapidly than is possible by pressure.

Operative measures include various sutures,—mediate, immediate, subcutaneous,—the trimming off of the fringe interposed between the fragments, and washing out the joint. The following operation is preferred,—if operative treatment is elected: Through a median incision extending a little above and below the fragments, sharp hooks are inserted into each fragment, drawing them apart, and the joint is flushed with sterile "normal" salt. The whole line of fracture is now exposed by lateral retraction of the flaps, and, *without touching the*

tissues with his fingers, the surgeon elevates any interposed fascia and periosteum and holds them and the fragments in place with a few fine catgut sutures. A suture or two may also be taken in the capsule of the joint, if it is widely torn. These sutures may be reinforced by a single silk or stout catgut suture passed through the quadriceps tendon and the ligamentum patellæ and crossing the front of the bone. The skin is then sutured with silk. No drainage. A plaster bandage is applied and the patient sent to bed, where he remains with his foot elevated for a week. The splint is then removed, the skin sutures taken out, and the splint reapplied. A few days later the patient gets up on crutches. These and the splints he wears for a month. The splint is then cut down again, and he wears it in the day-time alone for another month. No further treatment is required. The operation may be done under cocaine. The reasons for preferring this operation to any other is that it fulfills the indications of washing out the joint, complete reduction, and firm immobilization in a thoroughly aseptic manner, and leaves behind no foreign body in the joint to set up suppuration or irritation. By keeping his hands from contact with the tissues the surgeon makes the operation as safe as, and safer than, any subcutaneous one, as has been borne out by the experience of ninety consecutive cases without suppuration (Stimson).

The Choice of Treatment.—The results of immobilization vary from a perfect functional result with about one-fourth inch separation to absolute loss of function with wide separation or stiffness in the joint. Such results are attained within about six months. Operation may give a perfect result with linear union, but, on the other hand, post-oper-

ative suppuration in the knee-joint may prove fatal. If the operation is successful the patient saves about two months of convalescence and a great many of the doubts and annoyances incident to mechanical treatment. Therefore the operation is to be preferred, if the risks of suppuration can be absolutely eliminated. Such is the case only when the surgeon is sure of his own cleanliness, as well as that of his assistants and instruments, is conversant with operative and aseptic technique, and is sure to keep his hands out of the wound. Under such conditions operation is to be elected, with the patient's concurrence.

If function is impaired by failure of union, operation is the only resource. For lengthening the contracted quadriceps its tendon may be nicked at the more tense places, and its lower fibres may be elevated from the femur. Care must be taken, however, not to impair the vitality of the tendon and the fragment of the patella attached to it.

Fractures of the Leg.—**UPPER END.**—Both bones may be fractured, or else the tibia alone. The avulsion of the spine of the tibia by the crucial ligaments is merely a complication of dislocation. A few cases of epiphysiolysis and longitudinal fracture of the tibia have been noted. If the line of fracture runs into the joint its functions may be impaired, and a tendency to displacement with a resultant genu varum or valgum must be foreseen and prevented by immobilization. Permanent traction may be necessary when there is much comminution.

Avulsion of the tubercle of the tibia is caused by muscular action quite as is fracture of the patella. Recovery of function may be expected if the leg is immobilized in extension on the poste-

rior molded splint and the fragment retained in place by adhesive plaster.

SHAFT.—The usual seat of fracture is at the junction of the middle and lower thirds, the fibula being fractured higher than the tibia. The tibia lies so near the surface of the limb that a diagnosis of its fractures is usually to be made by palpation. This subcutaneous situation also serves to make compound fractures frequent. If the tibia is fractured an accurate diagnosis of fracture of the fibula, often very difficult without the aid of the fluoroscope, need not be made. Fracture of the fibula alone may be made out by a localized point of tenderness elicited by direct pressure or pressure elsewhere along the shaft of the bone.

Edema and neuralgia are exceptionally likely to complicate convalescence from fractures of this region.

Treatment.—Reduction is accomplished by traction with the knee flexed to relax the gastrocnemius. A simple method of treatment is to keep the limb in a Volkmann splint for a few days until the primary swelling has disappeared, when a plaster bandage is applied from the toes to the knee, and changed every ten days until union takes place,—the sixth week. If bony union is delayed, the irritation of bearing some weight on the limb in its plaster incasement may prove beneficial. From the time of the application of the plaster splint the patient gets about on crutches. If it is wished to have him about from the first the Volkmann splint may be replaced by a twin posterior molded splint, the two halves of which, when they reach the ankle, diverge to cross each other on the dorsum of the foot.

The subject of ambulatory treatment has already been dealt with in the chapter on general treatment.

Compound fractures are best dressed

through a Volkmann or fenestrated plaster splint.

LOWER END.—Fracture of the shafts of both bones low down and irregular comminuted fractures require immobilization with the foot at right angle to the leg. Primary amputation is indicated for badly-communited compound fract-

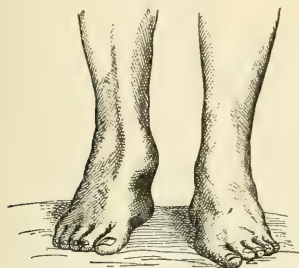


Fig. 16.—Pott's fracture, showing outward displacement. (*American Text-book of Surgery.*)

ures. The common fractures here are fractures by eversion and abduction (Potts) and fractures by inversion (external malleolus and rarely the internal one).

POTT'S FRACTURE.—This is the commonest fracture of this region. It is caused by eversion and abduction of the foot. The outward and backward displacement of the foot is typical (Figs. 16 and 17). Lateral mobility in the ankle-joint, combined with points of tenderness over the internal malleolus, over the lumen, tibio-fibular articulation in front and over the fibula above the malleolus are pathognomonic signs of this fracture. These tender points lie over the then typical lines of fracture, as shown diagrammatically in Fig. 18. The posterior portion of the articular surface of the tibia may also be crushed. Rupture of the deltoid and tibio-fibular ligaments may

replace the tibial fractures. The typical deformity is caused by the loss of the normal support to the inner side of the foot, and tibio-fibular diastasis, which allows the astragalus to slip backward, sometimes so far that it may be quite behind the tibia. If the displacement is not great the patient can walk, though painfully. The fracture of the internal malleolus may be compound.

Treatment.—To effect reduction the foot must be forced forward and inward, and immobilized in inversion. To maintain reduction posterior and external plaster-of-Paris splints are very serviceable, the former to extend from the upper third of the leg to the toes, the latter from the same level down to and around the foot, ending at the outer side of the dorsum, the so-called "stirrup-splint." In uncomplicated cases the patient may be allowed to get about on crutches as soon as the primary swelling has abated

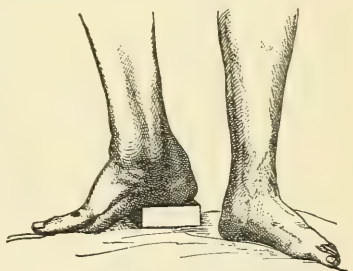


Fig. 17.—Pott's fracture, showing also backward displacement. (*American Text-book of Surgery.*)

—a new splint being then necessary—and after that need only be seen often enough to forestall any recurrence of the deformity. It is in Pott's fracture that ambulatory splints are most likely to be of practical use. Some patients can walk with only the support of a shoe, for, as

we have seen, the deformity is angular, outward, and backward, and as long as this angular deformity is prevented the functions of the limb are but little impaired. A plaster incasement fortified on the outer side and behind may meet the indications very satisfactorily. It should extend from the toes almost to the knee and be firm and heavy.

If the fragment of the internal malleolus cannot be reduced the knife must be resorted to.

While the results that follow careful



Fig. 18.—Usual three lines of fracture in Pott's fracture at ankle. (*Stimson.*)

treatment are perfectly satisfactory, old unreduced fractures are very troublesome. They may be improved and sometimes cured by supramalleolar osteotomy, or better still by opening both sides of the joint, chiseling through the old lines of fracture, removing obstructing callus, and reducing the fracture as though it were a recent one.

FRACTURE OF THE EXTERNAL MALLEOLUS.—This occurs by the opposite force from that which produces Pott's fracture, namely: inversion of the foot. If, as is usually the case, the fibula alone is broken, or the fibula and the tip of the internal malleolus are broken, it is suffi-

cient to immobilize the foot while it is pressed well inward to prevent widening of the mortise. But if the lower end of the tibia is broken obliquely across, as sometimes occurs, special attention should be paid to the backward displacement.

Fractures of the Foot.

FRACTURE OF THE ASTRAGALUS.—

This is usually associated with fracture of the os calcis, being caused by a fall on the foot. If there is no displacement the sciagraph is required for diagnosis, and the only treatment is immobilization of the foot. If, however, a fragment is displaced and cannot be reduced, or if the bone is crushed, the fragments had best all be removed, a complete excision of the bone giving a very satisfactory result.

FRACTURE OF THE CALCANEUM.—This may occur from direct violence, from strain on the plantar ligaments, and from forcible action of the muscles of the calf, putting the tendo Achillis on the stretch. Three weeks are required for solid union. If the fracture separates the sustentaculum tali, the limb must be immobilized with both knee and ankle flexed.

METATARSAL FRACTURES.—Rest, elevation, and massage will suffice for the cure of single fractures. Multiple fractures require a splint.

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FRIEDREICH'S DISEASE. See SPINAL CORD.

FROST-BITE. See SKIN, SURGICAL DISEASES OF.

FURUNCULOSIS. See SKIN, SURGICAL DISEASES OF.

G

GALLOPING CONSUMPTION. See PULMONARY TUBERCULOSIS.

GALL-STONES. See CHOLELITHIASIS.

GANGRENE. See WOUNDS, SEPTIC.

GASTRALGIA. See STOMACH, DISORDERS OF.

GASTRIC CATARRH, ACUTE. See STOMACH, DISORDERS OF.

GASTRIC CATARRH, CHRONIC. See STOMACH, DISORDERS OF.

GASTRIC FISTULA. See STOMACH, DISORDERS OF.

GASTRIC ULCER. See STOMACH, DISORDERS OF.

GASTRITIS. See STOMACH, DISORDERS OF.

GASTRODYNIA. See STOMACH, DISORDERS OF.

GASTROPTOSIS. See STOMACH, DISORDERS OF.

GAULTHERIA.—The *Gaultheria procumbens*, or winter-green, is a small, shrub-like evergreen plant, bearing a small, red berry (called teaberry, checkerberry, partridge-berry, boxberry, or deerberry) which is edible. It is indigenous to the woods of the United States, from the extreme north down to the Carolinas. The leaves alone are used for the two preparations which are official in the U. S. P. By distillation of the leaves a volatile oil (oleum gaultheria, U. S. P.) is obtained. This oil is of a light-straw color, which becomes darker on exposure

to the air. It possesses a peculiar penetrating odor, a sweetish, pungent, aromatic taste, and a slight acid reaction. It contains a hydrocarbon (gaultherilen) and an acid (methsalicylic acid); consists almost entirely of pure methyl-salicylate (99 per cent., according to Merck). It is soluble in alcohol, ether, chloroform, and carbon disulphide. Besides having medicinal virtues, it is often used as a flavoring substance to render mixtures more palatable.

Preparations and Dose.—Oleum gaultheriæ, 5 to 30 minims.

Spiritus gaultheriæ, 5 to 30 minims.

Physiological Action.—The physiological action of gaultheria is almost identical with that of salicylic acid; in small doses it is a stimulant and carminative. In larger doses it is an antiseptic, antipyretic, antirheumatic, and analgesic. Hare and Wood have shown that in therapeutic doses the oil is entirely decomposed in the system, although in tonic doses it may escape in part unchanged by the urine.

Poisoning by Gaultheria.—In slightly tonic doses there is produced a marked tinnitus aurium, nausea, vomiting, and rapid pulse. One ounce of the oil has proved fatal. In this case the principal symptoms were profuse diaphoresis, pain in the head and abdomen, purging; frequent, painful, and at last involuntary micturition; with convulsions, tonic spasms, dilated pupils, lessened arterial pressure, abolition of sight and hearing, rapid respiration, depression of the heart's action, and finally death by respiratory failure in fifteen hours.

Ten to 20 minims of the oil every 3 to 4 hours found to produce a marked ringing in the ears and subsidence of pain in 24 to 48 hours. In one instance of very painful muscular rheumatism $\frac{1}{4}$

drachm given every 2 hours, and 5 to 6 doses taken before the stomach rebelled. Excessive cinchonism was produced, with nausea and rapid pulse, but the pain disappeared. Dercum (Jour. of Nervous and Mental Dis., Jan., '88).

Fatal case of poisoning in a child of two years. It had taken about a drachm of the oil of gaultheria. The child had vomited several times and continued to do so until the stomach could be washed out. There was no immediate alteration of temperature and pulse. At the end of two hours the child appeared to have pain in the abdomen, was drowsy, and complained of thirst. The pulse rate increased to 150, the face was flushed, and the respirations were labored and irregular. There were evidences of impaired hearing and of visual hallucinations. The temperature was not increased, but there were slight twitchings of the hands and the muscles of the neck, and at this time delirium was first noticed. There were diarrhoeic movements, the stools having a strong odor of oil of gaultheria. Seven hours after the drug had been taken there was a general convulsion, and three hours later the child died of respiratory failure. J. W. Price and E. M. L'Engle (Amer. Jour. Med. Sci., Feb. 13, 1904).

Treatment of Poisoning by Gaultheria.

—The stomach should be evacuated by means of an hypodermic injection of apomorphine ($\frac{1}{10}$ to $\frac{1}{8}$ grain), or if conscious by any available emetic. Cardiac and respiratory stimulants (ether, caffeine, strychnine) are then indicated, using artificial respiration, and convulsions or spasms by the hypodermic administration of morphine.

Therapeutics.—The therapeutic uses of gaultheria are similar to those of salicylic acid. The oil utilized is principally in the treatment of acute articular rheumatism in doses of 5 to 30 minims, in capsules, in emulsion, or dropped on sugar, three or more times daily, as the case may require. Lint saturated with oil, wrapped around the part

affected, and covered with a piece of thin rubber cloth or rubber tissue to prevent evaporation, may be used, as suggested by Lannois and Limousin, in cases of acute and chronic rheumatic joints.

Oil of gaultheria tried in 122 cases of arthritis of various kinds, with uniformly encouraging results. When combined with suitable balneotherapy, the patients were cured more rapidly than when treated with baths alone. It is administered in capsules, each capsule containing 18 drops of the oil. Two capsules are given at a time, beginning when retiring, two one hour later, and two more during the night. E. von Rottenbiller (Klinisch-therap. Woch., May 20, 1900).

GELSEMIUM.—Gelsemium, U. S. P., or yellow jasmine, is the dried rhizome and rootlets of the *Gelsemium semper-virens*, a climbing plant indigenous to the southern United States. The odor is aromatic and oppressive and the taste bitter. Gelsemium contains a resinoid, gelsemin; an acid, gelsemic or gelseminic acid; and an alkaloid, gelseminine, which occurs in small, white, microscopical crystals which have no odor, but an intensely-persistent, bitter taste. The alkaloid forms salts which are freely soluble in water. The alkaloid itself is soluble in alcohol, ether, and chloroform.

Preparations and Dose.—Extract of gelsemium, fluid, 2 to 3 minims.

Tincture of gelsemium, 2 to 15 minims.

Gelseminine (alkaloid and salts), $\frac{1}{120}$ to $\frac{1}{30}$ grain.

Physiological Action.—Preparations of gelsemium do not produce gastric irritation. The active principle diffuses into the blood with great facility. In moderate doses gelsemium causes a feeling of languor and calm, slowing of the heart-action, drooping of the eyelids, dilatation of the pupils, and some feebleness of muscular movement. In larger doses gelse-

mium causes vertigo, amblyopia, diplopia, paralysis of the muscles of the upper eyelid so that it cannot be raised, dilated pupil, labored respiration, slow and feeble action of the heart, great muscular weakness, and diminished sensibility to pain and touch. These effects follow in a half-hour after stomach ingestion and last two or three hours, when they subside. (Bartholow.)

Case in which 10-minim doses of the fluid extract of gelsemium caused marked reduction of the pulse; it was then brought to 42 by an 11-drop dose. J. A. Muenich (Med. World, Aug., '91).

Poisoning by Gelsemium.—When lethal doses are taken the physiological effects are intensified. A staggering gait is followed by a loss of muscular power and a sense of general numbness over the whole body. The eyelids close, the muscles being paralyzed; the pupils become widely dilated and fail to respond to the stimulus of light; vision is lost. The lower jaw drops, the tongue becomes paralyzed, and speech is lost. The respirations are irregular, shallow, and labored. The heart-action is feeble and intermittent. The skin is generally covered with a profuse perspiration. The body-heat is markedly lowered. Internal strabismus is apt to occur (paralysis of sixth pair); the face becomes pinched and anxious. Death occurs from centric respiratory failure.

Case of poisoning observed from the tincture of gelsemium administered to a woman, aged 40, suffering from severe neuralgia; 10-minim doses every two or three hours were given the first day, and, no relief being obtained, 20-minim doses were administered for another twenty-four hours. Symptoms of poisoning then came on, consisting in a total loss of power in the tongue, alteration in vision, with widely-dilated pupils, and uncertain power of the muscles of the hand and arm. The patient was perfectly conscious. Then

$\frac{1}{120}$ grain of strychnine was injected, and in ten minutes a change for the better was noted. The vision was not perfectly restored for some hours. Edward Jepson (Brit. Med. Jour., Sept. 19, '91).

Though consciousness is present for a long time, drowsiness or stupor finally appears.

Treatment of Gelsemium Poisoning.—The evacuation of the stomach by means of emetics or the stomach-pump should be followed by the use of cardiac stimulants (ammonia and digitalis), the application of artificial respiration, external heat, and the hypodermic administration of atropine and strychnine to stimulate the respiratory centre. The maintenance of the horizontal posture is desirable. Faradization and the hot and cold douche are to be borne in mind.

Therapeutics.—Exaltation of sensory or motor function is an indication for the use of gelsemium. Small doses should be used at first, until the susceptibility of the patient is ascertained. Ptosis, or drooping of the upper eyelid, gives warning that the physiological action of the drug is present.

CEREBRAL DISORDERS.—In mania with great motor excitement and wakefulness, Bartholow considers gelsemium superior to conium.

To produce the best results, sufficiently large doses should be given to produce definite physiological effects: dilated pupil, drooping of the eyelids, and a feeling of languor. The excitement incident to acute alcoholism, simple wakefulness, and the insomnia following too great mental or physical activity are often benefited by gelsemium. In meningitis and cerebro-spinal meningitis, Bartholow recommends the fluid extract in 5-minim doses every two hours to maintain the physiological effect.

There is no drug equal to gelsemium in those crises of cerebral excitement

which were formerly combated by asafœtida and valerian. It should be pushed until heaviness of the lids and diplopia result. It is also useful in the early stages of acute bronchitis and in neuralgias. For the latter affection 3 to 5 drops should be given every $\frac{1}{2}$ to 1 hour, according to the intensity of the pain. The remedy can be used in all forms of organic disease of the heart without danger in ordinary doses. G. M. Garland (Boston Med. and Surg. Jour., Sept. 13, '88).

SPASMODIC DISORDERS.—In spasmodic cough, with little or no secretion from the bronchial tubes, gelsemium generally gives prompt relief. It has been recommended as a useful remedy in the spasmodic stage of pertussis, the nervous cough of hysteria, the nagging cough of phthisis with scanty secretion, and in reflex cough from irritation of the laryngeal nerves. Hysterical spasms are controlled by gelsemium, the patient becoming calm and tractable.

Gelsemium recommended to control an hysterical patient or relieve a cough. The tincture of the green root, in doses of 2 to 20 drops, has proved most reliable. G. F. Schreiber (Peoria Monthly Med., Dec., '89).

Chorea, laryngismus stridulus, and spasmodic dysuria have yielded to gelsemium in many cases. Torticollis and localized facial spasm may be relieved by the drug.

NEURALGIAS.—Facial, intercostal, ovarian, and other neuralgias have proved amenable to gelsemium. Large doses are sometimes necessary, relief not appearing until the characteristic drooping of the eye, dilated pupil, and muscular languor appear. From 5 to 20 minims of the fluid extract every three hours may be required.

Gelsemium considered the remedy *par excellence* for neuralgias of the lower jaw and the acute congestive stage of cold in the head. Fifteen to 25 minims of the fluid extract taken at night upon

retiring will dispose of the latter affection. It is useful in dysuria from whatever cause, as well as in the treatment of gonorrhœa when given in full doses and combined with an alkali. W. F. Jackson (Therap. Gaz., Nov. 15, '88).

FEVERS.—Bartholow has witnessed excellent results from the use of gelsemium in pneumonia and pleurisy. In the former it diminished respiratory activity, affording rest to the inflamed organ; it allays cough, lessens stasis of the pulmonary capillaries, and lowers the temperature. He suggests 5 to 10 minims of the fluid extract every two hours to maintain a safe, constant effect. The same method is employed in pleurisy.

Given in small doses,—that is, a teaspoonful of a solution containing 5 drops of the fluid extract in 4 ounces of water,—gelsemium has produced excellent results in cases of pneumonia; these were even more satisfactory when the drug was combined with aconite in the same proportion. J. Lindsay Porteous (Edinburgh Med. Jour., Dec., '90).

In remittent and intermittent fevers, when the temperature is high, the pulse rapid or full, the pupils contracted, breathing rapid, full doses of gelsemium should be given. J. F. Griffin (Med. Summary, Aug., '91).

Bilious and malarial fevers have been treated by the administration of gelsemium, especially in the Southern States, where it has enjoyed the reputation of a specific. Its utility is probably due to its antipyretic action.

SKIN DISORDERS.—Buckley has recommended gelsemium for the relief of itching in eczema: 3 to 10 drops of the tincture are given and increased every half-hour until the physiological effects are observed or the patient relieved. Not more than 1 drachm should be given in all within two hours.

MYDRIASIS.—Gelseminine in watery solution (1 to 64) has been recommended by Tweedy for use as a mydriatic. He

believes it equal to atropine. The effects disappear more rapidly. Its use is not without danger; it has not come into general favor.

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GENERAL PARESIS OF THE INSANE. See INSANITY.

GENTIAN.—Gentian (*Gentiana*, U. S. P.) is the root of the *Gentiana lutea*, or yellow gentian, indigenous to Europe. The root contains a bitter principle, gentianin, and an acid, gentianic or gentisic acid.

Preparations and Doses.—Gentiana, 5 to 30 grains.

Extract of gentian, 5 to 10 grains.

Extract of gentian, fluid, 10 to 30 minims.

Tincture of gentian comp., 1 to 8 drachms.

Physiological Action.—Gentian increases the flow of saliva and the secretion of the gastric juice. Increased appetite follows its use. Authorities believe this favorable influence on the appetite to be due to two factors: the sense of bitterness, which increases the desire for food, and the improved digestive powers which, enabling more food to be disposed of, postpones the sense of satiety.

Gentian is capable of exciting the automatic centres of the stomach, and of thus exaggerating its movements. Ferray (*La Tribune Méd.*, May 28, '91).

It favors assimilation by removing morbid conditions of the intestinal mucous membranes. This healthy stimulation ceases after long use, and the effects of overstimulation are observed.

Therapeutics.—Gentian is a valuable bitter tonic. It is indicated in convalescence from acute maladies, in atonic dyspepsia, in chronic gastric catarrh, in ma-

larial fevers, and in chronic malarial poisoning. The compound tincture of gentian (gentian, orange-peel, and cardamom-seeds) is a very useful stomachic.

Gentiana quinqueflora is a reliable prophylactic against abortion and all uterine disorders. It is especially valuable in menorrhagia of metrorrhagia depending wholly upon systemic causes. The author uses a tincture prepared as follows: *Gentiana quinqueflora*, bruised fine, 4 ounces; alcohol, 24 ounces; pure distilled water, 8 ounces. The mixture is allowed to stand for fourteen days; it is then filtered and ready for use. The tincture is given in doses of a tablespoonful every four hours. J. R. Cross (*Med. Brief*, Mar., '92).

GENU VALGUM AND VARUM. See ORTHOPÆDIC SURGERY.

GERMAN MEASLES. See RUBELLA.

GESTATION, ECTOPIC. See PREGNANCY.

GLANDERS, OR FARCY.

Definition.—This disease develops primarily in the nasal passages and bronchial tubes of horses and cattle, producing a mucous flow. It has been found to be due to the *bacillus mallei*. Large nodules form in the respiratory passages, and metastatic nodules in the liver, spleen, etc.

Symptoms.—In man the disease does not often present itself. However, veterinary surgeons, butchers, and those surrounded with horses are likely to contract the disease. It occurs in the conjunctiva and on the skin after some insignificant injury. Nodules result and the disease sometimes takes an acute form, beginning generally with malaise, pain in the limbs and back, and terminates in the breaking out of several abscesses over the body.

Case of a coachman observed into whose system the glanders bacilli gained

entrance by means of a wound of the finger. Multiple abscesses appeared in all parts of the body. Not till a few days before death was there a moderate discharge from the nose and increased salivary secretion. The patient died from exhaustion in six months. Proust (*Revue d'Hygiène et de Police Sanitaire*, Jan. 20, '88).

Bacilli of glanders can gain access to the body through the unbroken skin, penetrating the hair-follicles, traversing the epithelial cells, and producing the induration which characterizes the papules of the incipient disorder. Babès (*Lancet*, Aug. 25, '88).

Glanders is allied to the chronic and infectious diseases, and its normal host is probably one of the domestic animals; the bacillus is a parasite of its host; and it resembles morphologically the other bacterial parasites that produce chronic diseases in man, especially tuberculosis and leprosy. Holmes (*Jour. of the Amer. Med. Assoc.*, Aug. 12, '93).

Case of glanders which was remarkable for the fact that the large joints—*i.e.*, the elbow, the knees, and the ankles—showed suppurative inflammation, while the multiple abscesses in the muscles were absent. Errich (*Zeit. z. klin. Chir.*, vol. xvii, sec. 1).

Case of acute glanders characterized by the development in all the extremities of fluctuating tumors that contained hæmorrhagic pus. There were numerous broncho-pneumonic foci in the lungs. Toward the end of the disease a general pustular eruption appeared, and periostitis developed over the frontal bones. The diagnosis was confirmed by bacteriological investigation. Forestier (*Lyon Méd.*, No. 6, '97).

A number of bacteria cultivated that present the following characteristics: They decompose albumin; ferment the carbohydrates, with production of butyric acid and lactic acid in alcohol; they are of obligate anaërobic, and the group contains an organism that is non-motile, and causes glanders of cattle. Schattenfroh and Grassberger (*Münchener med. Woch.*, Jan. 8, 1901).

Diagnosis.—When the disease occurs

in the mouth or nose bacilli can be found in the mucous flow. When the disease starts internally the bacillus may be found in the sputum, or when the secondary abscesses form. It is of the greatest importance that these should be early recognized.

Case of perforating ulcer of the hard palate, with foul discharge from the nose and ear and gumma-like indurations appearing in various parts of the body, treated for some time as syphilis, till, after several months, the characteristic farcy-buds containing the glanders bacilli made their appearance. Death occurred from exhaustion. Editorial (*Brit. Med. Jour.*, June 16, '88).

Case in which the rapid diagnosis of glanders was made, after the method of Straus, by the inoculation of the suspected material into male guinea-pigs, which presented, after the second or third day, a marked glandular affection of the testicles, which is a special form of localization for this material. Silveira (*La Semaine Méd.*, June 17, '91).

The surest means for the diagnosis of pulmonary and nasal glanders is to inoculate some of the morbid products into cats and guinea-pigs, and to make control experiments with cultures on potato. If the animal dies of glanders, and the culture consists of the malleus bacillus, there is no longer any doubt about the disease; but this as a diagnostic means is not always easy. Helman has found a simpler means, in an extract of the malleus bacillus. This extract, called mallein, produces on horses attacked with glanders an elevation of temperature of from 0.9° to 5.4° F., and forms, at the seat of inoculation, a tumor which increases rapidly for two or three days and then disappears. Glanders is present whenever the above symptoms appear in the horse after the injection of mallein. This diagnostic procedure has already been adopted in the German army. Semmer and Wladinirow (*Revue Internat. de Bibliog.*, June 25, '93).

Serum reaction studied in two cases of glanders. While clumping of glanders bacilli is caused by various sera, the

sedimentation test, with a dilution of 505 and a time interval of at least four hours, gives positive specific results, no reaction being obtained with any serum but that of glanders. Heanley (*Lancet*, Feb. 6, 1904).

Treatment.—When the cause is local, energetic measures should be pursued. The erosion or seat of infection should be completely removed by means of the knife, and cauterizing by means of the thermocautery. Constitutionally, the administration of mercury has been advocated, but it is doubtful if the case would not prove fatal before the proper constitutional remedies could be had.

Owing to the certain amount of analogy between glanders and tuberculosis, the authors have used the creasote treatment, as well as Lannelongue's chloride of zinc, in glanders. The results have been found most satisfactory. Claudius and Michel (*La Semaine Méd.*, Aug. 24, '92).

Three cases of human glanders, one generalized and affecting especially the thorax, the other two localized, treated by gray ointment. The first case died the day after examination by the author. In the other two the abscesses were incised and disinfected, and friction with the gray ointment, 1 drachm daily, prescribed. Cure resulted in both. Gravelsky (*Wratsch*, No. 25, '93).

The injection of the serum of horses affected with glanders causes less rise of temperature in animals with the disease than the injection of mallein. Serum has been used for protective and curative, as well as for diagnostic, purposes. In one troop of cavalry twelve horses were injected, and after this no more cases of pulmonary glanders appeared. Repeated injections are necessary for protection. Schneidemuhl (*Brit. Med. Jour.*, Apr. 29, '93).

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GLOSSITIS. See TONGUE, DISORDERS OF.

GLOTTIS, CEDEMA OF. See LARYNGITIS.

GLYCERIN.—Glycerin (*Glycerinum*, U. S. P.) is a colorless, syrupy liquid, of a sweet, warm taste. It is obtained by the saponification of fats. It is soluble in water and alcohol. Exposed to the air it does not become rancid or undergo fermentation, and it increases in weight on account of its great hygroscopic powers. Glycerin possesses decided antiseptic and solvent powers.

Preparations and Doses.—Glycerin, 5 to 120 minims.

Glycerite of carbolic acid, 2 to 5 minims.

Glycerite of tannic acid (tannic acid, 20 per cent.), used locally.

Glycerite of starch, used locally.

Boroglyceride.

Glycerite of hydrastis, used externally.

Glycerite of vitellis (glyconin), used for emulsifying.

Glycerin suppositories.

Physiological Action.—Glycerin in the pure state is slightly irritating when applied locally to the skin or to the mucous membranes; it excites the secretions and causes an increased flow of blood to the parts; in some subjects it produces pain and decided irritation. The ingestion of glycerin causes no appreciable systemic effects. It sometimes acts as a laxative, but does not seem to affect digestion. Injected into the circulation in large amounts, glycerin causes convulsions, due to its hygroscopic powers (Hare). Although Pavy asserts that the ingestion of glycerin by diabetic patients increases the polyuria, others believe the contrary to be true, and find advantage in its use. The glycerin in stores other than responsible pharmacies is apt to contain arsenic. Vegetable glycerin should be preferred.

This substance is found normally in the blood in very small quantities, but this is not influenced by the condition of fasting nor by a diet rich in fats. After the intravenous injection of glycerin this substance is rapidly excreted in the urine. It appears that the renal epithelium exerts a powerful selective action on glycerin. M. Niclous (*Jour. de Physiol. et de Path. Gén.*, Oct. 15, 1903).

Therapeutics.—Good results have been obtained in the use of glycerin as a substitute for sugar in the alimentation of diabetic patients, but care must be taken that pure glycerin be administered.

Certain forms of glycosuria may be checked by glycerin. It acts more efficiently when introduced into the alimentary canal than when injected subcutaneously. It checks glycosuria by inhibiting the formation of sugar in the liver. By this means glycerin increases the quantity of glycogen found in the liver. Ranson (*Jour. of Physiology*, vol. vii, p. 202, '89).

[According to the clinical researches of Pavy, glycerin increases the polyuria of diabetes almost one-half, and for this reason he thinks it is not to be employed in this class of cases as a substitute for sugar. The quantity of glycerin recommended to be given, clinically, is 1 drachm, diluted with water at least one-half. H. A. HARE, Assoc. Ed., *Annual*, '90.]

CONSTIPATION.—In constipation the use of glycerin suppositories is followed by excellent results, but a too long-continued use may produce rectal irritation. When suppositories are not available, or for any other reason, glycerin may be given by rectal injection, 1 to 4 drachms being used.

Glycerin enemata tried in 26 cases, besides children, and it was found that 50 minims at once produced a copious evacuation, without leaving any disagreeable sensation. In no case did the drug lose its effect, though sometimes given regularly for many months. Seifert (*Münch. med. Woch.*, No. 9, '88).

Toxæmic symptoms may be suddenly produced by the use of ordinary enemata. A solution of some of the products of decomposition may take place, and a diffusible septic poison thus be introduced into the system by means of the lymph- and blood-vessels in that neighborhood. A rash may appear in these post-enemal cases, and, from appearances, cases have been pronounced scarlatina or rôtheln. No such symptoms or rash, however, have been observed in glycerin enemata, the amount injected being too small. G. H. Burford (*Lancet*, Dec. 15, '88).

Glycerin enemata tried in a long series of cases with good results. In patients with hæmorrhoids, however, the insertion of any syringe may be productive of pain. In 20 cases hollow suppositories of cacao-butter employed, each containing 15 minims of pure glycerin. This dose was found sufficiently large, and acting in fifteen to twenty minutes. It was never necessary to use more than one suppository, though there would be no objection to giving two. Boas (*Deutsche med. Woch.*, No. 23, '88).

The use of glycerin enemata in internal hæmorrhoids not approved. R. Lépine (*La Semaine Méd.*, Jan. 30, '89).

[In a few cases there has been observed a stinging in the rectum attending the injection, or a burning sensation, lasting a few minutes after the bowels were opened. It was found that this did not occur if the glycerin were mixed with a small quantity of water. In a few other instances there was actual rectal pain, due not so much to the action of the glycerin as to the passage of insufficiently softened fæces. J. P. C. GRIFFITH, Assoc. Ed., *Annual*, '89.]

Suppositories prepared by the addition of stearin and those put up with cacao tried. With the first preparation, in 208 cases, in which the results were noted, in 136 the desired effect was obtained and in 72 there was failure. The second kind of suppositories yielded better results, there being only 53 failures out of 230 trials. M. Schmelcher (*Therap. Monats.*, June, '89).

Injections of glycerin act very well in habitual constipation due to sedentary life, alimentation, etc. They are of little value, however, in cases where there is mechanical obstruction, and in constipation following febrile, cerebral, or medullary affections. Glycerin injections are of value in irreducible hernia, and should be used from the beginning. Injections of glycerin are superior to suppositories. If made for some time at a given hour of the day, spontaneous evacuation of fæces will eventually take place and the glycerin can be suspended. The injections are also useful during parturition, hastening the pain and the conclusion of the labor. In certain cases from 5 to 10 drops of glycerin are sufficient for an injection. A syringe should not be used, as there is danger of wounding the mucous membrane. Glycerin when thus employed, even for long periods, gives rise to no unpleasant symptoms. Anacker (*Deutsche med. Woch.*, No. 19, '93).

In acute coryza glycerin (1 part to 4 or 5 parts of water) may be used in spray or applied to the nares by a camel's-hair pencil. Diluted with equal parts of water, it is useful as a mouth-wash; it may be applied on a swab to relieve the dry mouth of typhoid fever or to facilitate the removal of sordes. If the sweet taste is objectionable Ringer suggests a mixture of equal parts of glycerin and lemon-juice. This is also useful in the last stages of chronic diseases, as phthisis, to relieve the dry, shiny condition of the mouth and tongue.

Glycerite of carbolic acid is a useful application to foul-smelling ulcers and open sores. Glycerite of tannic acid is a useful application in follicular tonsillitis and pharyngitis. Glycerite of starch is used as a vehicle for cutaneous remedies and as a bland protection to superficial abrasions and irritated surfaces. Glycerite of boroglyceride, an excellent dressing for ulcers, contused and lacerated wounds, etc., also does good service

as a depletant to the cervix uteri, a tampon, being soaked in it, applied locally to the cervix and renewed daily. In pelvic congestion the application of the tampons should be made two or three times daily, each application being preceded by a copious hot-douching.

Intra-uterine injections of sterilized glycerin in cases of fibromyoma recommended. A little over a drachm is slowly injected every two or three days, the vagina being subsequently tamponed with cotton or gauze saturated with boroglyceride. The effect of the drug is to cause dryness and atrophy of the endometrium, and hence diminution of the tumor. Chéron (*Rev. Internat. de Méd. et Chir. Prat.*, No. 6, '96).

The accidents that have occurred in the induction of labor by the injection of glycerin were caused by the drug being used in large doses for hygroscopical purposes, and not with the more physiological purpose of stimulating the unstriated muscle. The writer has used glycerin injections in two cases with marked success. He concludes that the injection of 5 cubic centimetres of glycerin into the cervical canal will bring on strong pains without leading to nephritis or any other ill-effect. It is free from danger of infection which attends injection into the uterine cavity. The introduction of a colpeurynter into the vagina serves to keep up the pains when they have started, and, therefore, makes further injection of glycerin unnecessary. Kossmann (*Therap. Monats.*, June, '96).

Glycerite of egg-yolk, or glycerin, besides being useful in preparing emulsions, is an excellent application for chapped hands or face. For this latter purpose glycerin, diluted with 1 to 3 parts of rose-water or orange-flower water, is an elegant preparation. Glycerite of hydrastis is a soothing and alterative application to unhealthy and sloughing sores, old leg-ulcers, and sloughing cancerous growths.

Eighty-five cases of renal calculus treated by glycerin. Passage of the stones occurred in from six to thirty-six

hours in 31 cases; in 21 cases there was subjective improvement; while in 33 the remedy proved quite inactive. Its action is due to the elimination of the glycerin by the kidneys, and that it serves to lubricate the urinary passages. The dose varies from $1\frac{1}{2}$ to 4 ounces, diluted with equal parts of water. Hermann (Ther. der Gegenwart, p. 214, '99).

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GLYCOSURIA.

Definition.—Evacuation of urine containing sugar in sufficient quantity to be revealed by the ordinary tests.

Symptoms.—Glycosuria is a symptom occurring under various conditions and compatible with perfect health; transitory glycosuria does not give any morbid symptoms and is only revealed by examination of the urine.

Case of a man, aged 25, who accidentally discovered the presence of sugar in his urine. He had no symptoms whatever of diabetes. He was the oldest of 11 children, and examination of the specimens from the other 10 showed high specific gravity and the presence of more or less sugar in all. They were all healthy and passed a normal quantity of urine. The patient passed about 10 per cent. of sugar a day, but this quantity could be somewhat reduced by an exclusive milk diet. L. C. Wadsworth (Med. Record, May 29, '97).

The amount of sugar contained in the urine may be determined by various tests (*vide* DIABETES MELLITUS), of which Trommer's and Fehling's are commonly preferred.

Etiology.—Glucose, or dextrose, is a constituent of normal urine, but it is present in too small a quantity to be discovered by the ordinary tests. By the aid of the phenylhydrazin test, however, the presence of a small amount of glucose may be revealed in every sample of urine. Pavy estimates the quantity of sugar formed in healthy urine to be 0.5

per mille. The quantity of sugar contained in the urine is dependent on the amount of sugar present in the blood. According to experiences of Pavy, normal blood contains 0.6,—1 per mille of glucose; v. Noorden states that the urine will contain sugar enough to be revealed by the ordinary tests as soon as the amount of sugar in the blood exceeds 0.2 per cent. This may be obtained experimentally by ingestion of large quantities of sugar, and in this form of glycosuria—alimentary glycosuria—the variety of sugar in the urine is always identical with that ingested: By ingestion of dextrose, glycosuria, or dextrosuria, is caused; by the ingestion of lactose, lactosuria; saccharose, saccharosuria, etc.

The amount of sugar necessary to produce glycosuria in a healthy person has been found to be:—

Of dextrose, or glucose, more than 180-250 grammes.

Of saccharose, more than 200 grammes.

Of levulose, more than 200 grammes.

Of lactose, more than 120 grammes.

When the stomach is full even larger quantities can be absorbed without causing glycosuria. Alimentary glycosuria cannot be produced in healthy persons by ingestion of starch.

[Miura (Zeits. f. Biol., B. 32) took one morning 1200 grammes of rice cooled in water—containing 308 grammes of starch; he experienced no consecutive glycosuria. F. LEVISON.]

According to Rosenfeld, physiological glycosuria can be differentiated from the pathological variety by the administration of a starch, such as that contained in white bread. It always causes an increase in the glucose in the urine of diabetics, but does not influence the sugar in normal cases.

In the urine of lying-in women lactose generally appears between the second and fourth days of lactation; it again dis-

appears after a short time. When the secretion of milk is suddenly stopped large quantities of lactose are for some time excreted with the urine.

[Zuelzer administered sugar of milk to lying-in women ("Inaugural Dissertation," Berlin, '95) and found that this substance is more easily eliminated in the puerperal state than in the normal state. F. LEVISON.]

In women during gestation the administration of 100 grammes of grape-sugar followed by appearance of from 1 to 18 grammes in the urine. Alimentary glycosuria frequently found in the course of traumatic neuroses, and in cases of phosphorus poisoning, in which fatty degeneration of the liver has occurred, 20 per cent. of the sugar administered is excreted in a few hours. V. Jaksch (Centralb. f. innere Med., May 25, '95).

In various diseases alimentary glycosuria is more easily produced than in health; this has been tried by giving small quantities of sugar (less than 150 grammes of glucose) to patients suffering from various diseases. The result of these experiences has been very unsatisfactory. Diseases of the brain, the spinal cord, the peripheral nerves, the muscles, and functional neuroses do not seem to predispose to alimentary glycosuria.

Glycosuria can be produced in a healthy man by giving a large quantity of glucose early in the morning, the stomach being empty. The quantity of glucose necessary to produce this effect varies from 4½ to 5 ounces. It is necessary that this quantity be given all at once. The occurrence of this so-called alimentary glycosuria depends not only on the quantity of glucose taken, but also on the rapidity of absorption.

In cases of marasmus, anaemia, cirrhosis of the liver, progressive muscular atrophy, and arteriosclerosis no diminished power of sugar destruction could be detected. But in cases of neurasthenia or traumatic neuroses there was a diminished power of sugar destruction, and glycosuria could be induced more readily than in health. In cases of habitual

drinkers of large quantities of beer, glycosuria could be readily induced by 3, 2½, or even 1½ ounces of grape-sugar. The same condition the author discovered in some cases after the drinking of an excessive quantity of beer (2 quarts) rapidly. Alimentary glycosuria does not occur in all great beer-drinkers. A. Strümpell (Berliner klin. Woch., No. 46, '96).

Investigations on about 800 patients, representing a great variety of diseases. In 75 cases autopsies were performed and histological studies of the pancreas were conducted. Although disease of the pancreas does not invariably produce alimentary glycosuria, yet when the latter occurs regularly in any case it is very likely that some pathological change has taken place in the gland. Alimentary glycosuria apparently represents an early stage of diabetes mellitus, and may be an important diagnostic indication for the existence of disease of the pancreas. Wille (Deutsches Archiv f. klin. Med., Aug. 18, '99).

Alimentary glycosuria does not depend on a local disturbance, but on the lowered capacity of the organism to assimilate dextrose. This constitutional lowering of the assimilation limit represents a sign of degeneration in a chemical sense. Emil Raimann (Wiener klin. Woch., Feb. 22 and Mar. 1, 1900).

Transitory glycosuria has been observed after concussion of the brain and apoplexy, after violent neuralgia and mental sufferings.

Study made of 211 cases of head-injuries in order to determine the frequency of traumatic glycosuria and its possible relation to the nature of the lesion. There were in the 211 cases 20 that presented glycosuria.

Conclusions: 1. After head-injury sugar may appear in the urine as early as six hours and disappear within twenty-four, the average time for its appearance, however, being from eight to twelve hours; for the disappearance of the same, from the fifth to the ninth day. 2. A small proportion of the cases may exhibit a permanent glycosuria from the date of injury to the head. 3. Acetone

and diacetic acid are rarely, if ever, found in such cases, excepting where the condition becomes a permanent glycosuria, and even then probably only after a number of months or years. 4. Of the 20 sugar cases here recorded, 11 (55 per cent.) had received an injury to the right side of the head; 5 (25 per cent.) to the left side; 3 (15 per cent.) to the occiput; and in 2 (10 per cent.) there were no external evidences of violence. 5. Of the 20 cases, 8 died,—6 deaths being the direct result of severe injuries, 1 from intercurrent disease, and the third probably from alcoholism. In the 211 cases, 16 were fatal, 50 per cent. of these having glycosuria. Higgins and Ogden (Boston Med. and Surg. Jour., Feb. 28, '95).

Case of glycosuria in which death followed speedily after the passage of a sound employed to search for vesical calculus. Glycosuria may cause localized urinary symptoms, thus causing danger of vesical instrumentation in these cases. Bazy (Archives Générales de Méd., June, '95).

Case of glycosuria apparently dependent upon the presence of numerous thread-worms in a child of 5 years. After expulsion of the worms by san-tonin the glycosuria disappeared and the child regained its former health. Parry (Brit. Med. Jour., June 8, '95).

In frogs with a normal liver glycosuria constantly follows tying all four limbs with the animal lying on its back; in the prone position it is evoked only by very powerful traction. If the liver is not normal the glycosuria does not occur, and it can be prevented in any case by division of the sciatic nerves. Confinement of a frog head downward in a narrow cylinder so that it is unable to move entails glycosuria, which is here also prevented by section of the sciatics. Extirpation of the liver inhibits this "restraint glycosuria." Restraint glycosuria is unaffected by stimulation of the sciatics, which of itself tends to cause the appearance of sugar in the urine; similar effects follow section of the cord above the entrance of the roots of the sciatic and also perforation of the lumbar cord. Bilateral extirpation of the lungs or ob-

struction of the air-passages causes glycosuria. Hence restraint glycosuria may originate from an unusual position of the body, from powerful motor-nerve stimulation, and from great diminution of the respiratory capacity. Velich (Wien. klin. Rund., May 17 and 24, '96).

Temporary glycosuria may result from strangulation of the duodenum or jejunum in man, but that this condition exerts no unfavorable influence upon the course of the wound, and affords no contra-indication to general anæsthesia. F. Neugebauer (Wien. klin. Woch., Sept. 10, '96).

Glycosuria is a symptom of cancer of the pancreas. It only shows itself in the early period and disappears toward the end. François Guillon (Gaz. Méd. de Nantes, July 23, '98).

Five cases of men who, after tramping the country for longer or shorter periods, showed temporary glycosuria. In each patient the liver was enlarged, greatly in two, and more resistant than in health, but gave no signs of any marked cirrhosis. They had led an unsettled life, and their food had been meagre and poor. In hospital, on a mixed diet, rich in carbohydrates, the sugar rapidly disappeared from the urine in each instance. Hoppe-Seyler (Münchener med. Woch., Apr. 17, 1900).

In giving a summary of observations and experiments upon the pathology of adrenalin glycosuria the writers point out that its intensity and duration depend partly upon the method of administration and partly upon the dosage. Direct applications to the surface of the pancreas of an exceedingly small quantity of adrenalin usually cause a considerable excretion of sugar, while the reaction becomes less in direct proportion according as the administration is intravenous, intraperitoneal, or subcutaneous, the result being slightest after dosage by the mouth. This relative inertness when administered by the mouth appears to be due to the readiness of adrenalin to become oxidized, thus losing its blood-pressure-raising properties, and when in the stomach a considerable proportion is destroyed before absorption takes place. Experimentally paint-

ing the pancreas of a dog with 0.01 gramme ($\frac{1}{10}$ grain) of adrenalin substance was productive of 23.4 grammes (4 drachms) of glucose; but the susceptibility of different dogs to reaction varies considerably. The sugar of the blood becomes regularly increased, but falls rapidly with the decline of the sugar in the urine, the volume of which latter is distinctly in excess, and this occurrence of glycosuria was shown to be independent of changes in the general blood-pressure. From observations upon the sugar of the blood of the femoral artery, portal vein, and hepatic vein before and after pancreatic painting with adrenalin the relative excess in percentage in the hepatic vein after treatment points to an increased production of sugar in the liver. That adrenalin in producing glycosuria acts chiefly upon the cells of the pancreas is presumed from the fact that the glycosuria is more marked after painting on—or injections into—the gland than after similar treatment of the brain, spleen, liver, or kidneys. The action of potassium cyanide in producing glycosuria when applied to the gland substance, while it has no such effect when introduced into the circulation or into other organs, lends support to the theory that the pancreas is chiefly concerned in the production of adrenalin glycosuria, the glycogenetic function of the liver being stimulated through the sympathetic nervous system. Adrenalin exerts its influence probably by a toxic action upon the cells of the pancreas, more especially in the islands of Langerhans, though lesions of these structures were not a constant accompaniment in experimentally produced glycosuria, and when present were generally associated with alterations in other structures as well. That the adrenals normally influence carbohydrate metabolism by virtue of their internal secretions seems highly probable, but experimental evidence so far does not afford complete proof, since the glycosuria which follows even slight compression or injury to these organs may be due to some nervous influence as yet imperfectly understood. Herter and Wakeman (Amer.

Jour. of Med. Sciences, Jan., 1903; Brit. Med. Jour., April 11, 1903).

Glycosuria gravidarum may arise at any stage of pregnancy. It is not so serious as when diabetes antedates pregnancy. It may disappear in one pregnancy and reappear in another, and end fatally after successive attacks. It frequently arose during parturition, but is of no great importance. Labor is not materially affected, other conditions being equal. Pregnancy is most likely to be interrupted. Is very destructive to the fetus, even more so than syphilis. The maternal mortality is nearly 50 per cent. Diabetics should not marry. Death is usually by coma, no case of eclampsia having ever occurred in a diabetic. William Ruoff (Amer. Medicine, April 25, 1903).

(See DIABETES MELLITUS for pancreatic glycosuria.)

It is also seen consequent to poisoning by various poisons: morphine, prussic acid, mineral acids, nitrite of amyl, carbonic oxide, chloralamid, nitrobenzol, secale cornutum, etc.

[V. Mering (Congr. f. innere Med., '86) and Minkowski (Berl. klin. Woch., '92) demonstrated that it is possible by injection or ingestion of phloridzin, a glucoside contained in the root-bark of apple-trees, to provoke a marked glycosuria in animals or in man. F. LEVISON.]

When the pancreas is completely extirpated glycosuria results, though, if even a small portion of the pancreas remains in the abdominal cavity, this result does not appear. Hedon (Archives de Physiol., Normale et Path., p. 788, '94).

[By extirpation of the pancreas of dogs, Minkowski (Arch. f. exper. Path. u. Pharm., '93) was able to produce not only glycosuria, but all the symptoms of diabetes mellitus. F. LEVISON.]

Case of glycosuria for which no adequate cause could be found, but which was evidently associated with considerable gastro-intestinal disturbance. At the autopsy it was found that the pancreas had been almost entirely destroyed

by a large suppurating cyst. M. MacIntosh (Lancet, Oct. 24, '96).

Case in which glycosuria was caused by atropine. Experimental confirmation of this fact obtained by administering to rabbits appreciable quantities of atropine, which resulted in a production of glycosuria. It made no difference whether sugar was included in the food or not. F. Raphael (Deutsche med. Woch., No. 28, '99).

The habitual or excessive use of tobacco will not only aggravate an existing glycosuria, but it will, though less frequently, set up this condition. Tobacco influences the output of glucose in cases of glycosuria in three ways: First, by protracting the duration of transitory glycosuria and by imparting to alimentary mellituria a certain degree of chronicity; secondly, by increasing the quantity of dextrose in the twenty-four hours' urine, in the transitory as well as the chronic forms of glycosuria; thirdly, by transforming the moderate degrees of chronic glycosuria into the graver forms. Nicotine is not the causative factor in tobacco glycosuria. The substance in tobacco-smoke regarded as of greatest importance is the carbon monoxide due to the imperfect combustion. This view seems to find credence in the fact that glycosuria is only found in smokers of cigars, and not in those who use pipes. Heinrich Stern (Med. Record, Apr. 27, 1901).

F. LEVISON,
Copenhagen.

GOITRE.—Lat., *guttur*, throat.

Definition.—The terms "goitre," "bronchocele," and "struma" include all those conditions in which there is a persistent enlargement of the whole or a portion of the thyroid gland.

Such enlargement, most often *benign*, may, however, be also brought about by malignant growth within the organ, and, in that case, one speaks of *malignant* goitre; but it may be laid down that, in all the conditions included under this

term, there is some hypertrophy or overdevelopment of one or other of the tissues of which the gland is composed.

Thus, in a goitre, we may distinguish:

1. A general hyperplasia of the gland, all the tissues having undergone overgrowth.

2. We may find the follicles showing marked hypertrophy, with or without distension of their lumina with colloid material (parenchymatous and colloid goitre).

3. We may have to deal more especially with overgrowth of the interstitial substance (fibrous goitre).

4. Or, again, we may have to deal more especially with great distension of the vessels, more frequently of the veins, though some rare cases are recorded of aneurismal dilatation of the arteries (vascular goitre).

Such changes may either involve the whole of one or both lobes, or be confined to isolated portions of the gland. In the former case we have to deal more especially with the vascular and hyperplastic forms. In the latter the change most often begins with the parenchyma and the goitre develops in a nodular form. But both in the hyperplastic as in the nodular parenchymatous goitre the shape and appearance may be profoundly influenced by cysts. These cysts may attain considerable size and may be single or multiple.

Varieties.—Wölfler, who has written the fullest work upon the pathological anatomy of goitre, gives anatomical divisions which, however, are too elaborate for practical purposes. For the clinician this classification may be greatly simplified.

[Wölfler's classification is as follows:—

I. CONGENITAL. — 1. Hyperplastic. 2. Telangiectasic. 3. Cystic. 4. Adenomatous.

II. HYPERPLASTIC.—1. True. 2. Colloid.

III. ADENOMA.—1. *Follicular Adenoma*.—Formed of embryonal cells not differentiated in the vesicles, forming nodules varying in size from a pin-point to a hen's egg, and tending to hæmorrhage and development of large cysts. He further distinguishes several varieties of this form, namely: the vesicular, the acinous, the myxomatous, the fibrous, the angiocavernous, and the papillary form.

2. *Adenoma Gelatinosum*.—There is general enlargement of the lobe or of the whole gland. Two forms of this may be distinguished: (a) The acinous, quite the most common form of goitre, in which there is a growth of new gland-tissue with development of vesicles between the existing acini, which also undergo continued growth. In the vesicles new and old there is abundant development of colloid material. (b) The cyst-adenoma, in which the individual vesicles become greatly distended and may be the seat of intravesicular papillary growth either exogenous or endogenous; this form tends toward malignancy.

3. *Myxomatous*.—Here the normal follicles present contain little or no colloid, but are surrounded by an excessive hyaline or myxomatous stroma; the areas showing this change are nodular.

4. *Adenoma Cylindro-cellulare*.

IV. MALIGNANT ADENOMA.—Under this heading Wölfler includes the following forms: Growths within the gland having a carcinomatous appearance, but characterized by absence of metastases.

Simple typical adenoma of the gland with adenomatous metastases.

Simple gelatinous goitre with metastases.

V. CARCINOMA PROPER.—(a) Alveolar; (b) cylindrical; (c) squamous celled; this last apparently a modification of the previous form in which the cells are flattened instead of being cubical.

VI. CONNECTIVE-TISSUE GROWTHS.—(a) Fibroma. (b) Sarcoma, of which the following varieties have been described: Fibrosarcoma, round-celled, giant-celled, angiocavernous, and spindle-celled sarcoma.

VII. INFLAMMATORY ENLARGEMENT (ABSCESS-FORMATION).—Abscess-formation is very frequently metastatic (pyæmia); some cases are recorded of idiopathic abscess-development; other cases are recorded in which there has been diffuse infiltration of pus through the lobe of the organ between and in the alveoli and vesicles.

VIII. HÆMORRHAGIC ENLARGEMENT.—Such hæmorrhages are very extensive; they may be said always to occur in gland-tissues already the seat of the goitrous change. J. GEORGE ADAM.]

We may recognize the following forms:

(A) ACUTE GOITRE.—This form comes on very suddenly and is characterized by rapid enlargement of the gland, due primarily to vascular dilatation, found more especially among women.

(B) CHRONIC GOITRE.—I. *Congenital*.—This may be of very varying forms, as above indicated in Wölfler's classification. It is relatively rare.

II. *Vascular Goitre*.—This is most frequently due to a distension of the abundant venous plexus of the gland; the organ is generally enlarged and is liable to press upon the trachea, causing modification of the voice and not infrequently paroxysmal attacks of dyspnoea simulating asthma. As above stated, this form may develop acutely.

III. *Parenchymatous Goitre*.—Under this heading is to be grouped the vast majority of cases of the disease. We have to recognize that, both in the general hyperplastic form and in the nodular, there may be great variation in the changes which occur. But these changes appear to be essentially connected with alterations in the structure and functions of the follicles.

1. Thus in one large class of cases there is, as the most prominent feature, a great storing up of the colloid material within the follicles, of isolated lobules of one lobe, or of the whole organ, and

even in the lymph-spaces and—some would say—the blood-vessels of the gland. This is a form generally spoken of as *colloid goitre*, or *struma gelatinosum*.

2. *Adenomatous Goitre*.—In other cases we have to deal with the very opposite condition of marked overgrowth of the glandular epithelium in the more or less embryonic condition with little development of colloid.

3. *Cystic Goitre*.—Whether we are dealing with the colloid or adenomatous type, there is a liability to cystic formation. In the colloid variety occasionally such cysts may be of the nature of *retention-cysts* and may resemble in their development the emphysematous bullæ met with in the lung, several follicles, through atrophy of their walls, fusing into one. But more frequently such cysts, as was pointed out years ago by Rokitsky and of late by Bradley, are of hæmorrhagic origin, the new growth in the gland being very vascular and the position of the organ and its varying blood-supply rendering the vessels peculiarly liable to rupture. Hence, are produced smaller or larger spaces filled with albuminous fluid, more or less tinged with modified blood-pigment, corresponding in every respect to the cysts which may develop in the brain after hæmorrhage in that organ.

Case of acute enlargement of the thyroid gland in chronic parenchymatous nephritis. The enlargement was due to a dropsy of the gland. The serous cavities were free from effusion. This condition regarded as a vasomotor neurosis in association with Bright's disease. W. A. Edwards (Inter. Med. Mag., Apr., '92).

Further changes may occur in such parenchymatous goitres: there may be hyaline or mucoid degeneration, calcification, intra-acinous growth, or the eventual development of cancer.

4. *Malignant parenchymatous goitre*, or primary carcinoma of the thyroid, as above stated, would seem almost to originate in a gland which may, for years, have been the seat of a more or less stationary parenchymatous goitre.

IV. *Interstitial goitres* are relatively rare. 1. Among the benign forms may be recognized the myxomatous goitre, which is, in general, a parenchymatous or adenomatous goitre in which the interstitial tissue has undergone mucoid degeneration. 2. Fibroid goitre is always nodular, the nodules being recognized by their peculiar firmness and hardness. 3. Malignant interstitial goitre, or sarcoma, which is relatively rare, is characterized by its peculiarly rapid growth and by its tendency to ulcerate and to extend into the trachea or externally.

ACCESSORY THYROID BODIES.—Lying in the tissues between the hyoid bone and the aortic arch are occasionally to be found certain small bodies which at first sight may be mistaken for lymph-glands, but upon microscopical examination are seen to be of the nature of thyroid tissue. Gruber distinguishes between them the superior, inferior, and posterior glands.

These accessory glands occasionally become the seat of adenomatous or even carcinomatous enlargement, and may cause great difficulty in diagnosis. The posterior group, more especially lying behind the œsophagus or between the trachea and the œsophagus, must be kept in mind from the grave disturbances which may be caused, either in deglutition or in respiration, through their overgrowth.

Case of migratory goitre caused occasional attacks of cyanosis and dyspnoea. A small, movable tumor was seen on the right side of the neck. The tumor migrated at times toward the mediastinum, compressing the trachea and right in-

nominate vein. Removal of a few adenomatous nodules and fixation of right half of thyroid resulted in a cure. M. A. Wölfler (*Revue Gén. de Clin. et de Thérap.*, Sept. 26, '89).

Case of intralaryngeal thyroid tumor. There are only five or six such cases in literature. The patient complained of dyspnœa. On laryngoscopic examination a tumor could be seen under the right vocal cord. Three months later abscesses appeared in the left lobe of the thyroid, the patient finally dying of general septicæmia. On post-mortem examination the tumor was found to consist of thyroid tissue and to be connected with that gland. R. Paltauf (*Wiener med. Woch.*, May 16, '91).

Case of accessory thyroid in the base of the tongue, removed for great dysphagia. Recovery. Wolff (*Gaz. Méd. de Paris*, Oct. 10, '91).

Symptoms. — **ACUTE GOITRE.** — This form differs from the main mass of cases in that, within the course of a few days or even a few hours, the thyroid may so swell as to produce peculiarly severe symptoms, more especially of impeded respiration, prolonged inspiration, and paroxysmal dyspnœa; it may be followed by evidences of bronchial catarrh. Koenig notes that during the menstrual period, during which, as already stated, some hyperæmic enlargement of the thyroid may be noted, it is not uncommon for there to be a peculiarly raw cough and distinct modification of the voice directly due to this enlargement. In the more severe cases the respiratory disturbance may lead to death from asphyxia. Where death does not occur, the gland may gradually lessen in size and the goitre disappear.

CHRONIC GOITRE. — In goitrous regions it is a matter of common observation that the localized or generalized enlargement of the gland may, during a course of years, attain a very large size without causing its owner anything more than the discomfort attached to its

weight and its position. If the gland undergoes a general slow hypertrophy, the firm growth of the whole, by forming, as it were, a well-built arch surrounding the trachea, may lead to singularly little disturbance, and, where there is disturbance, it is more often due, not to growth inward, but to the pressure brought to bear upon the enlarged gland by the muscles' passing over its surface.

On the other hand, a relatively-small enlargement of the gland may, by pressure, bring about a very considerable disturbance; much depends upon the exact position of the growth.

[Thus, only recently, at an autopsy upon the body of a woman who had for some years past suffered from occasional paroxysms supposed to be asthmatic, and who died almost suddenly from extreme dyspnœa, I found that all the trouble was due to a localized enlargement of the isthmus of the gland, an enlargement which from the general stoutness of the woman had not been recognized during life. Dr. Anderson, of Toronto, recently exhibited, at a meeting of the Ontario Medical Association, a very similar case. J. GEORGE ADAMI.]

As might be expected from its position, it is in connection with the trachea that most often the first symptoms arise, pressure upon this leading to some embarrassment in respiration. The paroxysms of dyspnœa, which not infrequently occur, are ascribed to the catarrhal condition of the mucosa secondary to the pressure; but in some cases it would seem to me that the paroxysms are directly due to the pressure and connected with sudden enlargement of the organ, either through hyperæmia or, again, through hæmorrhage into the organ.

Case of wandering thyroid. It arose from the right lobe, lay behind the sternum, and caused paralysis of the right vocal cord by pressure on the right recurrent laryngeal nerve. The tumor

could be brought above the sternum by coughing. Reuter (*Deutsche med. Woch.*, July 23, '91).

A person who has goitre, but who has not suffered from dyspnoea at all or who has only suffered moderately, may have a sudden attack which may be fatal. A very few cases have been caused by hæmorrhage into the goitre; but this condition is excessively rare. The theory of Rose is that the pressure of the enlarged thyroid makes the tracheal rings non-resistant, so that the trachea is apt to be bent and its lumen become obstructed. He thinks that in these cases of sudden dyspnoea the trachea becomes kinked from relaxation of the muscles, which maintain the head in such a position as to keep the tube open, and that this is probably brought about either during sleep or anaesthesia. These cases do not occur always during sleep or anaesthesia. Very urgent dyspnoea is rarely brought on by the relaxation of the muscles during sleep, for if the position of the neck were the cause of the dyspnoea alternation of the position should relieve it, yet this is not the case. Charles A. Morton (*Bristol Med.-Chir. Jour.*, Sept., '96).

Where there is gradual compression upon the trachea, it is in general lateral, and it may be so extreme that the side-walls are pressed together and a triangular or even flat-sided tube be produced.

The alteration in the voice not infrequently met with in the goitrous is to be ascribed in different cases to two different causes: (1) to actual pressure upon the cricoid and thyroid cartilages, causing impediment in their proper action; and (2) to compression of the recurrent laryngeal nerves. There may also be pressure upon the phrenic and sympathetic nerves.

By the very size of the organ obstruction may be brought about in the veins of the neck and upper half of the chest, leading to chronic congestion of the upper portion of the body, so that the skin assumes a dusky appearance. It has

been noted by several authorities that in general the jugular veins are dragged inward, while the carotids are dislocated outward.

Rarely the parts supplied by the brachial plexus of nerves show the result of pressure upon that plexus, and we meet with paralysis of certain muscles of the arm, numbness of the fingers and other portions of the upper extremities. Such disturbances occur in growths of large size tending to spread downward beneath the clavicle and sternum.

It is rather remarkable that there is rarely any description of disturbances of deglutition; it would seem that, where there are large growths in the neck, the œsophagus easily adjusts itself to one or other side.

Apart from these symptoms due to local pressure, there are other symptoms which have been too much neglected, to be made out more especially in younger women, and of the same class as the psychoses seen in exophthalmic goitre. There may be no palpitation nor tachycardia and no exophthalmos, but, as Dr. Shepherd has pointed out to me in connection with the numerous cases occurring in the neighborhood of Montreal, very frequently the patients are of a nervous disposition, fearful, and unable to settle down to sustained work; tremors are very rarely observed. An interesting fact, however, is to be made out: that, upon enucleation of the cysts or enlarged adenomatous masses in the gland, the nervous condition almost immediately becomes so much improved that evidently these symptoms are allied to those of hyperthyroidism and exophthalmic goitre.

Subjects of goitre become insane about nine times as frequently as normal subjects. The degenerative and puerperal forms of insanity predominate in goitrous cases. Goitrous patients, with curable

forms of insanity, recover as frequently as do non-goitrous; nor is there any special difference in the duration of the disease. The thyroid gland, they conclude, has a direct action upon the central nervous system. Marzocchi and Antonini (Review of *Insanity and Nervous Dis.*, June, '92).

Still more rare, though occasionally recorded in those especially of middle life, is the supervention of symptoms pointing to atrophy of the gland-tissue and the definite development of myxœdema. The heavy appearance and disposition of many middle-aged goitrous subjects is very probably due to relative incompetency of the thyroid. It must be kept in mind that such symptoms of disturbed function of the gland deserve to be carefully sought out and recorded, for up to the present time little or nothing has been systematically accomplished either to distinguish the functional disturbances brought about by one or other form of "ordinary" goitre or to co-ordinate the symptomatology of ordinary and exophthalmic goitre.

Diagnosis.—If we leave out of account the enlargement of accessory thyroid bodies, the diagnosis of goitre (apart from that of the various forms of this condition) is a relatively simple matter, and from the position of the thyroid and the ease with which it can be palpated there is little likelihood of mistaking the persistent enlargement of this organ for any other condition. Where accessory thyroids are enlarged, it is practically impossible to arrive at an exact conclusion as to the nature of the enlargement, unless, indeed, this takes on the character of malignancy, and then the evidence of secondary growth affecting the bones, recognizable in some rare cases, would give a certain amount of support to the belief that the primary growth in the neck region originated in the thyroid tissue.

Between the forms of goitre, save as between benign and malignant, up to the present time very little stress has been laid upon differential diagnosis. If, in the first place, the whole of the lobe or the gland be uniformly enlarged, it is necessary to differentiate between the vascular and general hyperplastic goitres and the condition of acute suppurative interstitial thyroiditis. This last condition is rare, and the evidence of sepsis alone and the local evidence of inflammation will distinguish this from other forms.

Vascular goitre is characterized by the fact that pressure upon the organ leads to marked diminution in its size, the organ soon returning to its former dimensions after the pressure has been removed. In its slighter conditions simple hyperæmia of the gland leads merely to the rounding of the neck. In the very rare condition of struma aneurismatica there is marked pulsation, and upon auscultation arterial murmurs are to be made out.

GOITRE.	AERIAL TUMOR.
Not affected in volume by respiration.	Changes in volume; increases with expiration, cough, etc.; diminishes in deep inspiration and forced extension of the head.
More or less firmness.	None.
Bi- or tri-lobed, sometimes with prominences or large vessels on surface.	No such appearances.
Does not disappear on compression.	Disappears on compression.
No alteration in voice.	Frequent modification of voice.
Dullness.	Resonance on percussion.

Puncture will aid in diagnosis, a jet of air showing the nature of the malady. Aneurismal goitres are at times reducible a third or two-thirds, but not more. L. R. Petit (*Revue de Chir.*, Feb., Mar., May, June, '89).

With general hyperplasia there is absence of all these features, the organ is generally firm and enlarged, and there is a history of gradual development. Where the enlargement is of the colloidal or gelatinous type certain observers ascribe to it a more doughy feel.

In the nodular forms of benign goitre

it must be remembered that in a very large number of cases we have to deal with quite a series of different conditions. Some of the nodules may be firm and fibroid, others again, of various sizes, may present purely parenchymatous changes either of the colloid or of the adenomatous type, while, further, here and there throughout the gland some of the larger rounded nodules may present more or less evidence of fluctuation and, in short, may be cystic. Where such cysts are present, it may be laid down that we have always the indication of a previous and existing condition of parenchymatous hyperplasia or adenoma at the region where the cyst has developed.

Following points noted in diagnosis of a polycystic tumor of the thyroid: The rounded form, not at all recalling that of the thyroid in its normal state; the tendency to ascend, whereas hypertrophied lobes of the thyroid tend to descend. To assure one's self of its connection or otherwise with the trachea, the head is extended as far as possible to immobilize the larynx and trachea. A movement is then made to raise the tumor. If even a slight displacement takes place the tumor is enucleable without the trachea coming into great danger. Sometimes, however, the trachea is so softened that several rings can be dragged with the tumor, so that caution is necessary. Tillaux (*Revue Gén. de Clin. et de Thérap.*, Sept. 26, '88).

As between the benign and malignant goitres, the main point of distinction is the rapid progressive growth of the latter form. But, here, warning must be given that hæmorrhage into a goitre—a not infrequent occurrence—may lead to rapid localized enlargement. Such enlargement, however, is of sudden development, and after its first appearance it remains stationary; it is not progressive.

Malignant tumors of the thyroid, though rare, are more common in men than in women, and usually develop

from pre-existing goitres. R. N. Wolfenden (*Med. Press and Circular*, Dec. 12, '88).

Case of a man with a tumor of the neck of five years' standing. It was soft, solid, slightly lobulated, and occupied the whole space between the sternum and the thyroid cartilage. A parenchymatous goitre was diagnosed, but, on removal, the growth was found to be a fatty tumor, adherent to the anterior wall of the trachea. Alex. F. Matveieff (*Brit. Med. Jour.*, Sept. 12, '91).

Case of woman who has had a tumor in the neck for a number of years. It has gradually increased in size. It is hard, dense, lobulated, and apparently fixed, although it is not adherent to the skin. The patient has a peculiar strident croupy cough, labored respiration, and swallows with some difficulty. Enucleation was performed. The patient recovered promptly after the operation. The tumor was a sarcoma of the thyroid. G. F. Shears (*Clinique*, June 15, '98).

As between the cancerous and the sarcomatous goitres the distinction has been made that carcinoma tends to affect the surrounding lymph-glands and is peculiarly liable to have associated with it metastases in the bones, whereas sarcoma of the thyroid undergoes more local extension with a tendency to invade and ulcerate into the trachea, as again to infiltrate the skin and cause extensive malignant ulceration of the neck.

In some rare cases, it should be mentioned, where there is a localized goitrous enlargement confined to the isthmus, my experience would show that there is a danger of the condition's being overlooked. The same is true with regard to retro-œsophageal accessory goitres. Thus, in paroxysmal dyspnœa affecting more especially females, any possibility of such localized enlargement should be borne in mind.

Etiology.—We are as yet wholly ignorant as to what is the immediate cause of ordinary parenchymatous goitre, and,

while very numerous apparently predisposing causes have been adduced, not one of these, so far as I can see, can be said to be in action in every case. Indeed, at the present time too little care has been taken to distinguish between the various forms of goitre and to determine whether the sporadic cases are anatomically of the same character as those met with in regions where the condition is endemic. It is, in fact, the existence of these sporadic cases which, to a large extent, renders it difficult to determine the etiology of the condition. Certain conclusions can, however, be gained from a study of these predisposing causes:—

In regions where goitre is endemic—and it has been noticed both in Europe and on this continent (Michigan,—Dock; Ontario,—Clark, quoted by Osler)—the domestic animals, dogs and horses, also present the condition.

Goitre occurs in all parts of Michigan. It is most prevalent in the northern part. Fifty-two reporters give a total of four hundred and seventy-seven cases. Lower animals almost always have goitre where it is common to man. George Dock (Boston Med. and Surg. Jour., July 4, '95).

No race appears to be exempt; the condition has been found in all parts of the world, affecting all peoples. In America Munson has recently studied the prevalence of goitre among the Indians of the United States, and finds that the Crows, the Menoninees, and the Northern Cheyennes are particularly liable. At the same time among these tribes the disease is regional.

Of 147,873 Indians included in those reported on, 77,173 were inhabitants of goitrous tracts, in whom 1823 cases of bronchocele were found, or 2.36 per cent. This may be considered a minimum percentage, and the following conclusions are arrived at from the facts quoted:—

1. There is a strong racial disposition to goitre among the Indians.
2. It is a distinctly localized disease.
3. It does not appear to be caused by high altitudes, climate, or water containing excess of calcium-salts.
4. It is favored by unsanitary conditions, constitutional depression, and improper and excessively nitrogenous diet.
5. Hereditary influence is strongly marked.
6. Sex and puberty have a marked influence.
7. Cretinism and Graves's disease are rare; the former the rarer.
8. The tumors are smaller than among the whites, and treatment is unsatisfactory. E. L. Munson (N. Y. Med. Jour., Oct. 26, '95).

There can be no question that goitre manifests itself much more frequently and in general attains to a much greater size in the female than in the male. Statistics upon this point are very variable; St. Sager gives the proportions of 44 to 1; but this would appear to be excessive in most localities. Fischer has collected statistics showing that from 80 to 90 per cent. of all cases of goitre—and of cases of myxœdema, 86 per cent.—occur in women, while exophthalmic goitre seems to attack the same sex chiefly.

As above stated, the condition may be congenital. In the absence of clear evidence that a goitrous mother living in a non-goitrous region may give birth to children showing an already-developed goitrous condition, I am doubtful whether the condition can be truly said to be hereditary.

In 117 families in which one or more members suffered from goitre, all patients observed living in the town of Hamar and its environs, where the disease is frequently met with without being endemic, the disease had most frequently commenced in childhood, and rarely after the age of forty.

In 74 of the 117 families several members suffered from goitre, and in 48 of these the disease appeared in the di-

rect ascending or descending line, while it appeared only in the lateral branches in but 26 cases. Hemicrania, and this only in its typical form, was a symptom very frequently met with—both in the patients with goitre and in their relations with no goitre. Goitre considered as being of vasomotor origin. Vetslesen ("Etiological Researches Concerning Goitre," '87).

Seven cases of goitre observed in the same family. L. F. Mial (*Jour. of Laryng., Mar., '96*).

Kocher, who regards goitre as the first stage on the road leading to cretinism, holds similar views with regard to the congenital as opposed to the inherited nature of that disease.

As already stated, there appears to be a very close relationship between disorders of the thyroid and the sexual functions. We are as yet wholly ignorant as to what is the nature of this relationship.

Two cases in which hypertrophy of the spleen coincided with an increased volume of the thyroid gland. The functions of the spleen were destroyed by disease. The hypertrophy of the thyroid is in relation with the abolition of the function of the spleen. Cardone (*Archivii Italiani di Laringologia, Pt. 4, '88*).

Case of supposed goitre which was found to be a great hypertrophy of both sterno-mastoid muscles resulting from extreme dyspnoea, due to a post-manubrial tumor (probably enlarged glands) pressing on the bifurcation of the trachea. Foxwell (*Brit. Med. Jour., Apr. 18, '91*).

It is suggestive to note that, as pointed out by Gaskell in his address in the Physiological Section at the meeting of the British Medical Association in Liverpool in 1896, in forms which may be regarded as occurring along the line of vertebrate ancestry, the primal sexual organs lie in immediate connection with the laryngeal depression or groove from which the thyroid is developed; indeed the thyroid in these is a sexual organ. Certain it is that the thyroid is liable to show marked enlargement at the time of puberty, during menstruation, and during the period of child-bearing, and,

again, that a very large number of cases of goitre are traced back, both in man and woman, to the time of puberty or of other marked disturbance in the sexual organs. The slighter sexual disturbances of the thyroid are apparently of the nature of an hyperæmia. This hyperæmic condition if continued would seem to lead to more extensive parenchymatous changes.

Thyroid enlargement is very frequent in women who have uterine fibromyoma. In 56 cases of a gynæcological affection with enlarged thyroid, 44 times the former was a fibromyoma. Freund (*Gaz. Méd. de Paris, Oct. 10, '91*).

Goitre, common in a certain district, ascribed to increased blood-supply to the thyroid, due to the exertion consequent on carrying water in vessels upon the head. Thomas A. Glover (*Brit. Med. Jour., July 13, '95*).

Three cases in which, during pregnancy, a prompt removal of the enlarged thyroid gland was demanded, on account of severe dyspnoea and danger of asphyxia. In all the cases the operation was quickly performed and in all a good result was obtained. Von Fellenberg (*Zentralbl. f. Gynak., Oct. 17, 1903*).

In Switzerland Kocher finds, in studying no less than 76,000 school-children, that before the seventh and eighth years goitre is an exception, the condition increasing in frequency up to the thirteenth and fourteenth years.

Frequency of goitre at different times of life. Of 13,090 cases only 2209 were younger than 20 years. Between 36 and 40 there were 1371; between 56 and 60 the number fell to 878. Mayet (*Lyon Méd., Apr. 15, 1900*).

It is equally clear that goitre in general is endemic and that the vast majority of cases occur in certain well-defined areas. More especially is the condition found in mountainous regions, but not all; for example, it is not found in the Jurassic regions, or, again, according to Bircher, where the rocks are of freshwater formation. Bircher's map of the

distribution of goitre in middle Europe shows this relationship to mountainous districts very clearly, but shows, also, that the presence of high mountains and deep valleys is far from necessary for the development of endemic goitre. Frequent cases are found in the flat country stretching from the north of Paris toward Belgium and along the valley of the Thames. On this continent Michigan and the Island of Montreal, where cases are very frequent, are in general flat and low-lying districts, nor is the goitrous area in Ontario mountainous. Dock points out that in America goitres are found as well with drift as on the Laurentian and many intermediate formations.

In certain provinces of Bolivia the Indians suffer much from goitre. These same Indians are clay-eaters; the clay is composed of silica, alumina, lime, magnesia, protoxides of iron and manganese, potash, water, and organic matter. Albert S. Ashmead (*N. Y. Med. Jour.*, Aug. 24, '95).

Numerous authorities have attempted to show that the composition of the water ordinarily drunk bears a direct relationship to the development of goitre. But here again the evidence is very conflicting. It may be briefly stated that the presence or absence of chalk or of magnesia or iron and other mineral constituents, the carrying of heavy loads upon the head, intermarriage and several other factors due to surroundings and habits of life, must all be given up as possible factors in the causation of this disease. Yet there can be little doubt that the water consumed is an important factor. In Switzerland Kocher found that in the affected districts competent inhabitants are able to point out fountains whose water without exception has caused goitre in children who drank it, while families which had a private water-

supply were free from the affection. In one village, too, he was able to distinguish those who drank from one supply from those who obtained their water from another by the existence or non-existence of goitre.

Goitre in England is most prevalent in the carboniferous limestone regions. James Berry (*Brit. Med. Jour.*, June 13, 20, 27, '91).

The following conditions accompany the production of goitre: (1) absence of hygienic care, material and intellectual poverty; (2) age—12 to 15 years; (3) presence in the water of notable quantities of lime and magnesia (not absolutely general); (4) altitude; (5) carrying large burdens causing bending of the head, and bending of the head during work; (6) acute phenomena which seem to indicate an infectious origin. Venous stasis is a predisposing and infection a determining cause (existing in the waters or air of certain countries). The infection may run an acute course. Froelich (*Revue Méd. de l'Est*, Nov. 15, '91).

In a district having a population of about two thousand, the writer has had fifty-five cases of goitre under his care in the past two and one-half years. The soil of the district is excessively chalky, and, with few exceptions, the water-supply is obtained from deep wells sunk into the chalk. When the springs are low the water is drawn up and even consumed while still milky in color. The people who live on the tops of the hills and who drink stored rain-water are not affected with the disease. H. C. L. Morris (*Brit. Med. Jour.*, July 6, '95).

In the hills of Cumberland and Westmoreland, where goitre is endemic, iron, copper, and lead are found in large quantities. Paracelsus and other physicians of the sixteenth and seventeenth centuries accused metallic waters of causing the neck to swell, and even mention iron pyrites as a cause of goitre. Louis E. Stevenson (*Lancet*, Dec. 14, '95).

More than 76,000 school-children between the ages of 7 and 16 reviewed with their parentage and antecedents. The investigations were principally made

in the canton of Berne, Switzerland. The formulated results may be briefly stated as follows: The female is more frequently the victim of goitre than the male. In children between the ages of 9 and 14 years goitre reaches its highest degree of frequency, and rarely appears before they are sent to school, where the position of the head in writing and reading gives a tendency to the ailment. There is, therefore, a school-goitre. The secondary changes in the thyroid are proportionate to the advanced age of the subject. Congenital goitre is extremely rare. A still greater exception is congenital atrophy of the thyroid. The districts supplied with water from the fresh-water sandstone showed a prevalence of goitre, while in the districts in which the water originated from salt-water sandstone goitre was infrequent. The prevalence of goitre depended upon the abundance of organic elements in the water rather than upon its source, and that neither deficient nourishment, unhealthy dwellings, nor wretchedness and poverty is a direct causation. Often the districts rich in goitre are separated by narrow limits from those free from the disease and in goitre-laden localities were oases free from goitre. There were actual goitre-fountains, the water of which almost invariably produced goitre in the children that drank it. On the other hand, in localities where goitre was prevalent families who had a private water-supply were sometimes free from infection. Brooks and rivers and along open conductors of water were unfavorable. Kocher (Correspondent of Boston Med. and Surg. Jour., June 24, '97).

Study of causation of goitre in a district in India 2000 feet above sea-level. Strong evidence pointing to an organic rather than a mineral cause. The soil is extremely porous. The water contains no more than a moderate amount of organic matter and mineral constituents, is soft or moderately hard, and, except for minute traces, is free from iron.

The inhabitants, who live under the same climatic conditions, but with different occupations, may be divided into two classes: the native Bhutias and the Sepoy troops from the northwest prov-

inces. The former are omnivorous, but, by reason of poverty, mostly vegetarians. Their chief diseases are goitre, syphilis, and malaria. The temporary inhabitants, the Sepoys, are all vegetarians, and are healthy, practically free from syphilis, and living under excellent hygienic conditions. Examination of 169 Bhutias showed that over 75 per cent. had goitre; nearly 90 per cent. of those over twelve years of age were afflicted. Of 380 Sepoys examined, 54 per cent. had goitre. The Bhutias say that their goitres increase during the rainy season. All the British officers, also, during the preceding rainy season had suffered from enlarged thyroids.

Iron is present in the water only in very minute quantities. As to lime as a cause, it appears that many of the Bhutias without goitres are great lime-eaters, while of the Sepoys, who never touch it, over 50 per cent. had developed goitres within twenty months after arrival. The theory that the disease is due to carrying heavy loads up and down hills might satisfy in the case of the Bhutias, but not in that of the Sepoys, who, though not carriers, yet have goitre. Fifty-five per cent. of children under twelve had no goitres after living there always, or about the same percentage as did develop them among the Sepoys after a visit of only twenty months. E. E. Waters (Brit. Med. Jour., Sept. 11, '97).

The modern view of goitre is that it is caused by a *contagium vivum*, limited to certain areas for some unknown reason, existing in the soil and reaching man by drinking-water or unclean hands. The writer adds that the organism when introduced into the body induces an increased demand for thyroid secretion, which the gland hypertrophies to supply. The proofs are: 1. The gland enlargement is accompanied by no constitutional disturbance. 2. The microscopical appearances of the primary changes are those of a gland hypertrophied and active. 3. Treatment by thyroid is followed by reduction in size of the gland, which stops if the remedy is stopped. 4. The successful removal of a goitre by iodine treatment has been followed by

symptoms due to deprival of increase in gland-secretion.

Sporadic goitre may also be explained in a similar manner. Daniel McKenzie (Glasgow Med. Jour., Jan., '99).

More recently, Klebs, Kocher, Waters, and others have attempted to find a microbic causation for the disease. Thus, Kocher points out that goitre-water differs from free water in containing many more micro-organisms. And Waters contends that there may be micro-organisms of the amœba type resembling the malarial organisms with a selective power for the thyroid and its secretions.

Tavel, working for the Swiss Committee of Twenty-five Physicians, and comparing waters which were found to induce goitre with goitre-free waters, found that, while both were, upon chemical analysis, pure, the former contained numerous microbes. One form common to two goitrous waters inoculated into guinea-pigs resulted in the hypertrophy of the thyroid, but the same form had no effect upon dogs. Attractive as this theory may seem, however, in the absence of any other satisfactory explanation, two facts seem to be strongly opposed to it:—

1. That goitre affects females so greatly in excess of males.

2. That the disease, at least in its early stages, may be arrested and, indeed, cured by the removal of the patient from a goitrous to a goitre-free district.

If microbes play any part in inducing goitre it would seem from these considerations that they do not directly infect the organism, but by their products of growth, contained in the water in which they grow, they must induce a form of intoxication capable of affecting the female rather than the male. It will be seen that the whole subject of etiology is thus still in a very vague state.

The drinking-water carries the harmful agent. "Goitre-water differs from goitre-free water in containing many more micro-organisms." Theodor Kocher (Wiener med. Woch., Aug. 15, '91).

Case of thyroiditis of spontaneous development. The gland was not enlarged prior to the attack, although it had formerly been considerably hypertrophied. Bacteriological examination of the pus, withdrawn under strict antiseptic precautions, revealed the presence of pneumococci. It is the first case of the kind on record. Gérard-Marchand (Le Bull. Méd., June 21, '91).

Cases of metastatic thyroiditis operated on by Kummer and examined bacteriologically by Tavel. In the first the goitre had existed for fourteen years. The patient was attacked with diarrhœa and fever; two days later, severe pains in right side of neck. The thyroid became inflamed and respiration was impeded. Right half of the thyroid removed, which was found to contain two cysts,—one colloid, the other inflamed. The latter was found to contain the typhoid bacillus (of Eberth). This established the nature of the original disease. The second case was one of post-puerperal thyroiditis. In the pus were numerous streptococci which had, doubtless, invaded the organism at the time of labor. Both cases recovered. Nicaise (La Semaine Méd., May 27, '91).

Case of a young man who had a goitre which had given him very little trouble. After an attack of typhoid fever an abscess formed in the gland, which was opened aseptically. A microscopical examination and a culture showed the presence of the typhoid bacillus in a pure state. F. Colzi (La Semaine Méd., Aug. 19, '91).

Observations in the valley of Aosta, where goitre is endemic. Conclusions: (1) all the examinations of water used for drinking purposes by the subjects of endemic goitre revealed the presence of numerous bacteria; (2) the constant presence, in variable quantity, of a bacillus which liquefies gelatin, and has special morphological and biological characters; (3) this water, given to horses and dogs in a district exempt from goitre,

produced an enlargement of the thyroid; (4) it is not yet proved that elimination of the microbes destroys the power of the water to cause goitre. Lustig and Carle (Med. Bull., July, '91).

The disease believed to be due to an organism of an amœba type, and resembling the malarial organism, with a selective power for the thyroid or its secretion. For a time the system opposes it, and sometimes successfully, but, when it overpowers the phagocytic resources of the system, the thyroid enlarges in the effort to combat the poison. Under thyroid feeding (two 5-grain tabloids daily) the records show a weekly diminution of a quarter to half an inch in the circumference of the Sepoy's necks, and when the treatment ceases the gland again increases in size. That is to say, additional resisting-power is administered in the shape of thyroid tabloids, which keep the poison in check and allow the gland to recover its normal size, but on withdrawing the accessory agent there is diminished resistance and again an increase in size. E. E. Waters (Brit. Med. Jour., Sept. 11, '97).

1. The causation of simple goitre is directly associated with the water habitually drunk by the subjects of the condition.

2. No single constituent or contamination has so far, despite extensive search, been found common to the waters of goitrous districts.

3. The peculiar epidemics at times recorded, coupled with the lack of discovery of chemical or toxic cause, appears to indicate miasmatic—i.e., microbic—causation.

4. If it exists, the microbic agent is yet to be discovered.

5. A long series of forms can be made out from, on the one hand, those showing well-marked goitres with dulling of intellect and bodily habit approaching to the myxœdematous type, through goitres presenting no generalized disturbance, save occasionally such as may be attributed merely to pressure upon the surrounding organs, to other forms of ordinary goitre showing symptoms of the same order as those seen in exophthalmic goitre, to cases of true exoph-

thalmic goitre, and, finally, to cases showing no enlargement of the thyroid, but certain of the general symptoms which are peculiar to Graves's disease. Adami (Montreal Med. Jour., Jan., 1900).

The only two predisposing factors that stand out at the present moment as likely to be predisposing are, indeed, alterations in the sexual function and the nature of the drinking-water. Attempts have been made, both in the Pyrenees and again in Michigan, to cure or arrest the onset of the condition by boiling or filtering the water. Kocher recommends the same. So far adequate evidence as to the effect of these measures is lacking.

Pathology.—To discuss at all adequately the pathology of goitre, the minute anatomical differences between the various forms of goitre alone would take up far too much space. But there are certain points which must always be kept in mind. The first of these is the remarkable vascularity of the normal thyroid. As Councilman has pointed out, the size of the thyroid arteries is larger than that of those going to the brain. This, in itself, indicates that the blood-supply must be relatively enormous, and that the functions of the gland must be relatively very important to the economy. The second is with regard to the nature of the secretion into the vesicles. The evidence at present before us would appear to show a close relationship between the lymphatics and the cavities of these vesicles. What that relationship is has not been adequately proved, but it would seem that the colloid material is formed by an inspissation and possibly a modification of the excretion from the epithelial cells lining the vesicles; and inasmuch as numerous observers have pointed out the presence of similar colloid material in the lymphatics in the immediate neighborhood of the vesicles,

it is very possible that normally the lymphatics carry away the material elaborated by the cells. That this material is of importance to the organism has been abundantly demonstrated in the last few years by the researches of Baumann and Robert Hutchinson. The latter has conclusively proved that the albuminous colloid material carries or contains what may be termed the active principle of the gland, and that, if this colloid material thus isolated be given to myxoedematous patients, it has all the good effects of the full extract of the gland. And he has shown that combined with it there is iodine; in fact, that Baumann's thyroiodine obtained from the whole gland is evidently the active albuminous substance in this secretion.

Primarily, the parenchymatous goitre would seem to be an overgrowth of the gland with overactivity, although such overgrowth may eventually give place to atrophy and inactivity of the specific glandular substance. It is very suggestive that, in a large proportion of cases where the goitre is not of too long development and is of the parenchymatous type, the iodine treatment has for long years been found to give good results. We are, in short, only just now seeing the beginning of a knowledge of the relationship of parenchymatous disturbances in the thyroid to disturbances of the general body-metabolism, and at the present we can do little more than carefully note the nature of the anatomical changes of the organ, without being in any way sure of their bearing.

In the study of the histology of the vascular system of thyroid in goitre the author has examined twenty-eight glands taken from subjects varying in age from a fœtus of the fourth month to an adult of 68 years. Death in these cases was due to a variety of causes. In glands containing goitrous nodules ar-

teries were found in which there were well-marked proliferations of the endothelium in localized areas, forming bud-like projections. In one specimen these proliferations frequently occluded the artery. The groups of cells forming these buds may cause little or no projection of the intima, but may develop outwardly at the expense of the muscular coat. The size of the buds varies much within certain limits.

As buds have been found containing colloid, they would seem to have the power of producing this material. The larger arteries are almost or altogether free from these changes. R. M. Horne (*Lancet*, Nov. 26, '92).

Goitre-formation apparently begins by a growth of processes of the normal glandular epithelium. The first clearly-visible beginning of the nodular goitre consists of single processes of differentiated epithelium in the secondary lobules. These processes gradually supplant, metaplastically, the normal tissue of a secondary or even a primary lobule. The lobules thus changed form, as they increase in volume and supersede the surrounding tissue, the smallest true goitrous nodules. Neighboring lobules changed in this way form multilobular goitrous nodules, either blending by a growth through the intervening septa or flattening where they come in contact. Finally, the outer compressed lobules surround the central, more vigorously growing ones like a shell. The metaplastic growth ends when the boundary of the primarily-affected lobule is reached, growth then taking place by displacement of the surrounding tissue. Diffuse goitre consists of a uniform proliferation in all the lobules. Nodular goitre arises through a variation in the vitality of neighboring parts. There exist a great variety of intermediate forms. T. Hitzig (*Schmidt's Jahrbucher*, July, '94).

The most frequent fact observed in ten cases was the presence of fine granular matter in the follicles, and in such quantity that in some cases it surpassed that of the homogeneous colloid masses. These granulations are of the greatest importance in explaining the formation of colloid matter, for they form one of

the preliminary stages, and the progressive transformation from one to the other may often be seen in the same follicle. In this transformation there is not only a modification of density, but a change of color also. The origin of the granular matter is located in certain large round or oval elements, larger than the epithelial cells, with pale protoplasm, but formed by the same fine granular masses as the rest of the follicular contents which surround it. These are considered to be only modifications of epithelial cells. The special point of interest in this process is the complete absence of homogeneous drops, of irregular balls or masses, giving birth to colloid matter by their confluence. The formation of colloid substance in goitre should, therefore, be considered as a purely degenerative process. Reinbach (*Beiträge zur path. Anat.*, etc., B. 16, p. 596, '95).

Prognosis.—Upon the whole, save in malignant forms of the condition, the prognosis must be regarded as favorable. Even where no steps are taken to arrest the growth, it is a matter of common observation in goitrous districts that persons for long years may bear tumors of great size without pronounced ill effects. Occasionally, however, severe, not to say fatal, respiratory disturbances may supervene in those with comparatively-small goitres, either from hæmorrhage into the gland or from development of nodules in such a direction as to press on the trachea. Lucke has noted that occasionally after acute febrile disease a goitre may entirely disappear, and this vascular form, if of recent development, may spontaneously diminish in size.

Even where the goitre is of considerable duration, removal to a non-goitrous region may be followed by rapid diminution of the tumor, save where cysts are present; in young people and children such removal may, with fair certainty, be depended upon to cure the

state. Failing this, the medical treatment about to be described leads to marked improvement in the majority of cases. While, again, failing this, resort may be had to surgical means, and very little danger need be anticipated of any untoward result.

Treatment.—Treatment of the condition may be divided into medical and surgical.

MEDICAL.—The use of iodine and the various preparations of the same is quite the most valuable. According to Koenig, this drug is more especially of use in the hypertrophic and follicular forms, not so much in the colloid; especially in recently-developed goitre is it useful. It may be employed either externally over the goitre or in the form of potassium iodide given in large doses by the mouth. In this use there is some danger that the symptoms of iodism may supervene, but, as Koenig points out, we may not truly be dealing with iodism, but with symptoms of cardiac stimulation and rapid emaciation due to the rapid reabsorption of the colloid material into the blood.

Dangers of potassium iodide referred to in treatment of goitre. Goitrous subjects are particularly susceptible to iodism. M. Ferrand (*Le Progrès Méd.*, Nov. 23, '95).

Where cysts are present, iodine is useless and surgical means must be employed.

Mosetig-Moorhof has used injections of iodoform with slight constitutional reaction and excellent results, more especially in the soft varieties of goitre. Kapper, Frey, and Rosenberg all confirm the value of this method.

Soft varieties of goitre treated by author for the past ten years by injections of iodoform, with slight constitutional reaction and excellent results. The following solution was used under the strictest antiseptic precautions:—

R Iodoform, 1 part.

Ether, 5 parts.

Ol. olivæ, 9 parts.

Or

R Iodoform, 1 part.

Ether,

Ol. olivæ, of each, 7 parts.

Beginning injection is $15\frac{1}{2}$ minims; the author has injected as much as 62 minims at one time, injected in two places. Intervals should be five to eight days. Five to ten injections, according to the size, etc., of the tumor, are necessary for a cure. Mosetig-Moorhof (*Inter. Jour. of Surg.*, Mar., '90).

The following solution, which should be kept in a glass-stoppered bottle, recommended:—

R Iodoform, 15 grains.

Ether, 105 grains.

Sterilized olive-oil, 105 grains.

The skin of the neck is carefully disinfected, a needle plunged into the goitre, and the injection made.

Half a syringeful may be injected at first, increasing gradually to an entire syringeful. At first the injections should be practiced every fourth day; later, every second or third day.

The injections produce usually a slight sensation of burning, which ordinarily disappears in a few minutes, but sometimes persists for several hours.

Complete cure experienced in nearly 45 per cent. of cases, and decided improvement in about 50 per cent. Usually, at least twenty-five injections are required. Rosenberg (*Lyon Méd.*, Jan. 9, '98).

Two cases of simple goitre in young girls treated by injections of oil containing 40 per cent. of iodine. Fifteen drops of the oil were injected very slowly at intervals of about one week into the substance of the gland. Each injection was made into a different part of the gland, and while in no case was there any unpleasant reaction, two or three of the injections were followed by the appearance of a small, firm node showing no signs of inflammation. These eventually disappeared. Dubar (*Le Progrès Médical*, No. 4, 1904).

Another treatment which has of late years been tested with promising results

in a certain proportion of cases is the administration of preparations of the thyroid gland. Issai, Vas, and Garg found that in three cases the use of thyroid tablets led to diminution in the size. Serapin confirms this observation. Stabel in twenty-six cases of goitre found that thyroid medication was beneficial. The best effects were obtained by the use of the fresh gland. Bad effects were noted in several instances from the use of the tablets, though Ewald came to contrary results, obtaining better results with the tablets than with the fresh gland. The parenchymatous form of goitre in young chlorotic girls was most benefited. Mendel obtained no improvement by use of tablets, and had to abandon treatment on account of the palpitation and emaciation which it caused. Perhaps the largest series of cases is that quoted by Angerer of 78 cases treated with raw gland. Only 4 or 5 remained uninfluenced. The hard fibrous growths remained totally unaffected, and, like other observers, he found that it is the small, soft, parenchymatous goitres, more especially in young people, that are most favorably influenced.

On the whole, therefore, the employment of fresh sheep's gland would seem to give the best results, and more especially in young persons and those suffering from the softer parenchymatous forms of the disease, whether diffuse or nodular. What the exact method is in which the thyroid taken leads to favorable results is a matter of doubt. To state that it causes physiological rest to the gland is, perhaps, begging the question. It is further to be noted that only in early cases does it appear to result in complete cure, and where cysts are present these are in no wise reduced in size, although, through the shrinking of the surrounding tissue, they may become

more easily enucleated. (See ANIMAL EXTRACTS.)

Twelve cases in which the thyroid-gland extract was used. In 5 cases observed in the hospital and in 5 outpatient cases a definite influence of the treatment could be observed; the goitres markedly decreased in size, but in no case disappeared. Nearly the same effect is obtained by the well-known iodine treatment. The experience of many years shows that nearly 90 per cent. of all the cases can be improved by the use of iodine; only in 10 per cent. does surgical treatment become necessary. The new treatment will probably have no great practical value in the treatment of goitre. Kocher (Corres. f. Schweizer Aerzte, No. 1, '95).

Administration of fresh thyroid gland or dry extracts of the gland to patients suffering with psychoses in association with parenchymatous goitre, while followed by pronounced diminution in the size of the enlarged gland, is unattended with any influence upon the mental state. On the other hand, the medication also occasioned no unpleasant effects. Reinhold (Münch. med. Woch., No. 52, p. 1205, '95).

Differences exist in different patients in respect to the effect of thyroid treatment upon metabolism. Albuminuria and glycosuria are regarded as unfortunate effects; the former is rare. Denning (Münchener med. Woch., Apr. 23, '95).

Results of treatment of sixty cases of goitre with thyroid. Cases of benign parenchymatous goitre were put under treatment without any selection. Cystic cases and those of malignant disease were excluded, as were also cases of exophthalmic goitre. Instead of raw thyroid, tabloids were used in the dose of 2 daily to adults, 1 to children. Unpleasant symptoms, such as palpitation of the heart, nausea, diarrhoea, tremor, headache, etc., were treated by temporary withdrawal of the remedy. The duration of treatment was from three to four weeks on the average. In young children complete recovery was the rule. In older children marked diminution in the size of the goitre was observed, with

cessation of symptoms. In adults recovery was rare and less common in proportion to age. Complete return of the thyroid to its normal size is not to be expected later than the twentieth year.

Mild relapses were seen only three times, and in each case rapidly relieved by renewal of treatment. Bruns (Amer. Jour. Med. Sci., May, '95).

One hundred patients treated with thyroid extract, 78 of whom suffered from goitre. The raw sheep's gland, finely minced, brought directly from the slaughter-house to the hospital by one of the attendants and there carefully examined, so that any diseased tissue may be at once detected and rejected, employed. Many of the toxic phenomena following its exhibition are due to early putrefaction. Of the 78 cases treated only 4 or 5 remained uninfluenced. A few showed such excessive reaction after its use that it had to be discontinued. In the majority the goitre soon showed distinct signs of retrogression. Only the hard fibrous growths remained totally unaffected. In cystic goitres the substance of the gland atrophied around, while the cyst remained distended, but seemed to become more superficial, so that its subsequent enucleation was much more simple. The same result occurs in the adenomatous growths, the isolated tumor or knots coming to the surface and being much more distinct than formerly. It is the simple, soft goitres that are mainly influenced, and especially those occurring in young people. The bleeding in subsequent operations is much less than when thyroid extract had not previously been employed. One unfortunate result is produced, viz.: a certain amount of heart-weakness, which becomes very marked during and after the administration of the anæsthetic. Relapses also sometimes occurred after the cessation of the thyroid treatment. O. Angerer (Münchener med. Woch., Jan. 28, '96).

Thirty cases of goitre observed in which sheep's thymus was used, sometimes in its natural state and sometimes in the form of pastils of English manufacture. The thymus was administered in the form of hash spread on bread, in

quantities of 150 grains for children and 225 grains for adults, three times a week. The effects of the treatment were ordinarily manifested at the end of three or four weeks, and the results remained the same when the treatment was continued for a longer time. Three patients, children 10 and 12 years of age, were completely cured anatomically. In 18 cases there was considerable amelioration, with diminution in the size of the tumor and in the symptoms provoked by it. In 10 cases the treatment failed completely. In none of the cases were toxic symptoms. The effects of the medication are particularly appreciable in diffuse, simple, hyperplastic goitre. Reinbach (*Mittheilungen aus der Grenzgebiete der Med. u. Chir.*, i, p. 202, '96).

Under thyroid treatment the goitre diminishes in size, and may even sometimes return to its normal condition. When the treatment is carefully carried out and the effect watched, no complications occur. It has also a beneficial influence upon the nervous system. K. P. Serapin (*Wratch*, No. 5, Feb., '96).

The fresh glands selected with care and preserved on ice do not give rise to the toxic symptoms so frequently reported. In 25 cases of simple goitre of parenchymatous and fibrous character improvement was noted in 23, while in 2 the disease seemed completely arrested or cured. The treatment must, however, be continued to maintain the results obtained. Tablets of thyroïdin found considerably less advantageous than the fresh glands. Stabel (*Berl. klin. Woch.*, Feb. 3, '96).

Better results obtained with the tablets than with the fresh gland, the most remarkable effects being observed in young chlorotic girls suffering from parenchymatous goitre. Complete recovery, however, did not take place, but slight symptoms of thyroidism, as moderate albuminuria with casts, noted, disappearing as soon as the treatment was suppressed. Ewald (*Univ. Med. Jour.*, Apr., '96).

Use of tablets noted in three very carefully observed cases; the conclusions are as follow: 1. The goitre has diminished in size. 2. The body-weight is dimin-

ished, the most marked result being obtained after long-continued use, and is in proportion to the amount of the gland-substance taken. 3. The amount of urine is increased. 4. The nitrogenous excretion in the urine is increased. 5. The balance of nitrogenous excretion is a negative one: *i.e.*, more is excreted than is taken in. 6. The uric-acid excretion is increased, especially during the first days of the treatment. 7. The excretion of sodium chloride and of phosphoric acid is increased. A. Issai, B. Vas, and G. Garg (*Deutsche med. Woch.*, No. 28, s. 439, '96).

No improvement obtained in ten cases in which tablets were tried. The treatment was abandoned on account of the palpitation and emaciation which it caused. Mendel (*Univ. Med. Jour.*, Apr., '96).

In the tetanic condition toxins are found in the blood which are rendered innocuous by the antitoxin—"thyreo-antitoxin" of Frankel—which is formed in the gland-alveoli. In the myxœdematous condition, on the other hand, a poisonous proteid "thyroproteid" is formed in the tissues, passes into the blood, and is fixed by the thyroid. Here it is rendered innocuous by the action of an enzyme which splits it up into two parts: a proteid constituent which unites with "thyro-iodine," and the other a carbohydrate. Notkin (*Virchow's Archiv*, Suppl., H., B. 144; *Edinburgh Med. Jour.*, Mar., '97).

Iodothyryn used in four cases of goitre. The dose employed was 4½ grains per day during extended periods, varying from one to three months.

In three of these cases, subjects from 12 to 18 years of age, who presented small recent fleshy goitres, which were accompanied by intense respiratory symptoms, the medication caused a rapid disappearance of the dyspnoea. After having been five months under treatment they are considered completely cured. Poucet (*Revista de Laring., Otol., y Rin.*, No. 11, '97).

Case of goitre cured in a newborn infant by submitting its wet-nurse, who also had a goitre, to the thyroid treatment. Every day during five days a tab-

let containing 22 grains of the gland was taken by the nurse; after an interval of five days the treatment was resumed, and so on until the treatment was discontinued. The infant's goitre disappeared after six weeks' treatment, that of the nurse became considerably smaller. *Mosse (Brit. Med. Jour., Apr. 23, '98).*

Summary of results in 849 goitres, of which 33 were malignant. Thyroidin was found more efficient than iodine. Two hundred and thirty-six benign goitres were operated: 2 by puncture and iodine injection combined, 64 by enucleation, 174 by extirpation, and 1 by tracheotomy. Socin's method is now used in all cases.

The incision commonly used was a curved one along the border of the sterno-mastoid. Recovery, on an average, took 11 days after enucleation and 14 days after extirpation. The mortality was 4 deaths from pneumonia, 1 by toxæmia, and 1 by chloroform death. In this case a persistent thymus was found. *A. Schiller (Beiträge zur klin. Chir., B. 24, H. 3, '99).*

During the last four years three-fifths of personal cases have been treated with iodine, and two-fifths with the thyroid preparation. In 30 thus treated it has been found that the patients who received the iodine improved more rapidly than the others, and during the last three months all patients have been taking iodine, only accompanied by tonics as required. Few of them can take iodine steadily for many weeks without showing evidence of weakness; slight anæmia is likely to follow, with increased rapidity of the heart's action; often slight dyspnoea and headache, with diminution of bodily weight. Therefore the patients should always be weighed when the treatment is commenced, and frequently afterward. The formula is as follows:—

R Iodini (crystals), 2 grains.
Pot. iodid., 4 grains.
Alcoholis, 1 drachm.
Syr. simplicis, 1 drachm.
Aque destil., 2 ounces.

A teaspoonful to be given in a wine-glassful of water, one hour after each

meal-time. After about two weeks, sometimes from the beginning, an iron tonic is given; *Blaud's pill*, ferri subcarbonate, or tincture of iron and, if the patients are weakening rapidly, strychnine combined with calisaya and iron, the iodine being discontinued for a week or two at a time. After three weeks there is usually a perceptible difference in the size of the goitre. In six months many of the goitres disappear, others are reduced from one-half to one-eighth their original size. Many patients breathe better and their voices improve. Some do not yield to the treatment. Three months' trial is sufficient in such cases. If the goitre is cystic, or if fibrosis is extensive and the goitre interferes with the voice, respiration, or heart's action, or if there is a large goitre accompanying Graves's disease, and no contra-indication exists, operation should be advocated. *F. C. Schaefer (Jour. Amer. Med. Assoc., Nov. 25, '99).*

The most promising cases for thyroid treatment are those of simple parenchymatous enlargement occurring in adolescents and in young adults. The enlargement is a true hypertrophy of the gland, which occurs in response to some demand for an increased supply of its secretion. With thyroid extract, the hypertrophied gland is able to pass into a resting condition. It is a useful preliminary to operation, as it induces decrease of the gland, with relief of dyspnoea. This is sometimes effected even in goitres in which cysts and adenomata are present, by atrophy of the gland-substance in which the cysts or adenomata are imbedded. *Murray (Edinburgh Med. Jour., Aug., 1900).*

SURGICAL.—If, after treatment with iodine or with thyroid extract, no effect is produced, then operation becomes advisable.

Three months considered ample time for the exhibition of drugs, when, failing improvement, operation becomes advisable. Pressure on the trachea causing dyspnoea, and on the recurrent causing hoarseness, indicate early operation. *John B. Roberts (Amer. Lancet, Feb., '95).*

The surgical treatment of bronchocele has for many years been a subject of great interest, and to Kocher, Socin, and the Swiss surgeons much credit is due for the gradual development of successful methods of operation. As above indicated, it is more especially in the cystic forms that nowadays there is need to operate. Several methods have been suggested, the earlier being either incision of the cyst (Beck) or puncture, followed by injection of iodine.

Following directions given for the use of tincture-of-iodine injections: 1. Be sure that the needle is in the body of the tumor before injecting. 2. Avoid, as far as possible, the veins distributed in the cellular tissue over the tumor.

The syringe must be aseptic; it must be plunged slowly, but without hesitation, into the gland. The syringe must then be taken off to see that no blood flows from the needle. This precaution is necessary to avoid injecting into a vein. Inject very slowly; 8 minims is enough for the first injection. If this is well borne (*i.e.*, only slight pain with little swelling is caused), 15 minims can be used next time. One should wait a few seconds after making the injection before removing the cannula; only one injection to be made at a sitting, and an interval of four or five days to elapse before the next. There is considerable radiating pain for a short time after the injection, also a metallic taste in the mouth for a few hours. Tincture of iodine is the best substance for injection. Terrillon (*Bull. Gén. de Thérap.*, Sept. 30, '89).

Case in which a goitre had diminished one-third after injection of tincture of iodine twice a week for four months. The last injection was followed by convulsions and death, due probably to thrombosis. Sixteen cases of death after parenchymatous injections collected. Heymann (*Med. News*, Nov. 23, '89).

Iodine injections should not be used on account of the danger connected with them, and on account of the periglandular adhesions which they cause. These

adhesions afford especial difficulties in the event of a surgical operation becoming necessary. G. Naumann (*Centrab. f. Chir.*, July 9, '92).

Injections of iodine are only efficacious in recent parenchymatous goitres, but in these they are of great value. Brunet (*Archives Clin. de Bordeaux*, Feb., '95).

These methods are often followed by reaccumulation of fluid or hæmorrhage into the the cysts, and extirpation of the cyst as first suggested by Juillard and Kottman, now as modified by Socin into his method of enucleation, gives excellent results both in the case of cysts and in that of nodular parenchymatous growths.

In this country, Shepherd, following Socin's method, has had singularly good results in enucleating both cystic and nodular colloid growths. In the cystic forms he taps the cyst and evacuates some of the contents, and then the cyst-wall can be peeled off from the gland-tissue with the fingers or the raspatory much as an adherent ovarian cyst is peeled off from its surrounding structures. Should a vessel come to view, it is easily tied. Thus the operation is made one that is almost entirely external to the neck. It is remarkable how rapidly healing takes place after these operations, even when a huge cyst has been removed.

Seventy-two cases treated surgically. In 33 cases extirpation was performed and in 39 cases enucleation. Where possible, enucleation preferred, being simpler and safer. Encapsulated tumors alone are suitable for enucleation; all others must be treated by extirpation. In 54 cases the operation was performed mainly or solely to relieve dyspnea. Deformity should never be the sole reason for operation, but dyspnea almost always demands it. Of the 72 cases, 3 died: 1 from chloroform and the other 2 because the goitres were large, rendering operations formidable ones. All the

39 enucleation cases recovered. J. Berry (*Brit. Med. Jour.*, July 7, 1900).

Operations on 110 cases for the relief of some type of thyroid tumor. Of these, 34 were for exophthalmic goitre, with six deaths. The Kocher collar incision preferred as giving the greatest exposure and the least scar. Anesthesia preceded with morphia subcutaneously, ether by the drop method being employed unless there is extreme dyspnoea or marked exophthalmic symptoms. In such cases cocaine by injection used. The exophthalmic cases which recovered from the operation were all benefited within three months; in only 25 per cent. was the improvement partial, the exophthalmos being slow to disappear. None of those who lived were made worse and those in whom death occurred were the most severe types of Graves' disease, with tachycardia of from 130 to 150. C. H. Mayo (*Jour. Amer. Med. Assoc.*, Apr. 23, 1904).

In cases of diffuse enlargement of the whole gland such enucleation is, of course, out of the question, and while complete extirpation of the whole organ is now never dreamed of on account of the imminent danger of development of myxoedema, observers have with a greater or lesser success performed a partial extirpation either of a whole lobe or a portion of a lobe. Kocher especially has employed this method, and his results, both by enucleation and by extirpation, have been remarkable.

Tetany following thyroid extirpation is very dangerous. Of more than 30 cases following thyroidectomy recorded there were 7 cures, 13 deaths, and 3 cases in which the disease became chronic. In 53 total extirpations in Billroth's clinic the affection appeared twelve times, of which 8 were fatal, 2 chronic, and 2 recoveries. Total extirpation to be avoided. In 115 partial extirpations in Billroth's clinic no case of tetany appeared. V. Eiselsberg (*Schmidt's Jahrbücher*, Apr., '90).

Results obtained in one thousand cases of goitre. Excluding the opera-

tions undertaken for malignant tumors and exophthalmic goitre only 3 patients had been lost out of 900 cases operated on during the last twelve years. One case of surgical myxoedema had resulted, and that was due to the fact that the half-gland that was left behind had become atrophic,—a point not noted until the removal was accomplished; the symptoms soon disappeared with the use of a sheep's thyroid. In the last 200 cases not a single patient was lost. Kocher (*La Semaine Méd.*, Apr. 24, '95).

Interstitial injections condemned and surgical intervention advocated. In 292 cases operated upon the mortality was 1.36 per cent. Respiratory difficulties, impeded deglutition, and cardiac troubles regarded as indications for intervention. In 104 cases ablation by Kocher's method was practiced, and in 73 enucleation by Socin's procedure. Roux (*Annales des Mal. de l'Oreille, du Larynx, du Nez, et du Pharynx*, Sept., '95).

Three hundred operations for goitre performed in the Tübingen clinic. The proportion of females to males is 2.5 to 1, and in the male sex goitre is apt to begin between the fourteenth and seventeenth years and in the female between the twelfth and sixteenth years. The majority of goitres occur in people who are obliged to perform hard, manual labor. The list contains only two cases of complete extirpation. The operation of choice has been intraglandular enucleation; but there are a number of examples given of extracapsular extirpation. These two methods may often be combined with advantage. Non-malignant goitre which is increasing rapidly in size ought to be operated upon, but one should never operate simply to relieve disfigurement. Bergéat (*Annals of Surg.*, Mar., '97).

Report of a series of 12 successful cases operated on by the method of Kocher. The original method is followed, differing only in the matter of drainage and suture. The operation is done under cocaine, and the important points are the absolute asepticism, careful ligation, avoiding the wounding of the gland, and the preservation of the

recurrent laryngeal nerve. Of the 12 cases, 11 were simple and 1 exophthalmic goitre. Drainage was only used in 4 cases and then abandoned. Subcuticular silver wire suture is preferred, and should be removed on the fifth day, together with the first dressing, which consists of silver foil and gauze. The second dressing is of gauze and collodion. One case of Graves's disease was operated on and 3 others which presented symptoms all improved and symptoms disappeared. I. Olmstead (Phila. Med. Jour., March 21, 1903).

Operative treatment is indicated, according to J. Collins Warren (Boston Med. and Surg. Jour., Dec. 27, 1900), when a rapidly growing tumor has resisted medical treatment and when pressure-symptoms arise. A U-shaped incision is made, sterno-mastoid muscle is drawn aside, and, if necessary, the sterno-hyoid, sterno-thyroid, and omo-hyoid muscles are cut. Injuring the capsule of the tumor with the knife must be avoided on account of hæmorrhage. The tissues at the upper and outer margin of lobe are then clamped and divided, securing the superior thyroid artery if possible. Clamping of the recurrent laryngeal nerve must be avoided. The growth is dissected away by cutting the attachments from the anterior wall of the trachea. A piece of gland the size of an English walnut must be kept, however, to prevent operative myxœdema. Silk is used to tie the vessels. Morphine is administered before or directly after operation to prevent vomiting. A loose, but stiff, dressing should be applied to give support. Eighty cases operated in this manner by Reinbach gave a mortality of only 3.75 per cent.

The experience of 42 cases of goitre treated by operation suggests that: medical treatment should not be neglected in cases of goitre. Cases which tend progressively to increase should always be submitted to operation before

they grow to a huge size, and before their deep connections become complicated. The operation of removal of one lobe and the isthmus is practically always followed by atrophy of the corresponding lobe. The operation is free from special risk, if done properly, and with the assistance of an experienced anæsthetist. Large old adherent goitres will still remain difficult and dangerous to remove, and it is the duty of every practitioner to urge this upon his patients and submit them to operation while removal is yet comparatively safe and easy. A. Marmaduke Shield (Edinburgh Med. Jour., July, 1901).

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GOLD.—Metallic gold is not official in the U. S. P. Only one preparation is recognized: the chloride of gold and sodium (auri et sodii chloridi, U. S. P.), which is given in doses of $\frac{1}{30}$ to $\frac{2}{10}$ grain.

The best vehicle with which to combine gold and sodium chloride in capsule is tragacanth or guaiac resina; neither of these decomposes it. The time for administration should be one hour after eating, or, better still, one hour before eating. The ideal method for administration is by hypodermic injection, the solution used being made with equal parts of aqua destillata and glycerina. Daniel R. Brower (Jour. Amer. Med. Assoc., Oct. 1, '98).

The following method is recommended for making permanent gold preparations: A mixture of 8 parts of 1-per cent. solution of gold chloride and 2 parts of formic acid is boiled three times, then cooled. Very thin pieces of tissue are put into the cooled mixture, which must be kept in the dark. After one hour the tissue is washed in distilled water and then placed in a mixture of 10 parts of formic acid and 40 parts of the distilled water and exposed to diffuse daylight. The reduction occurs in from 24 to 48 hours, when the violet tissue is transferred to 70 per cent., and after 24 hours to 90 per cent., alcohol

and kept in the dark for at least a week. It is then ready for the final manipulations, and may be teased and mounted in acidulated glycerol or cut into sections. E. L. Billstein (*Amer. Med.*, June 15, 1901).

Physiological Action.—The chloride of gold is a caustic irritant. In small medicinal doses the preparations of gold sharpen the appetite and promote digestion. If long continued, symptoms of overstimulation follow their use. Constipation is usually present. The mental functions become more active. Increased venereal desires are attributed to the use of gold. In men priapism is not uncommon. In women the menses are increased.

Poisoning by Gold.—The acute form of poisoning follows the ingestion of a tonic dose and manifests itself by a violent gastro-enteritis, accompanied by cramps, convulsions, trembling, insomnia, priapism, and insensibility. In the chronic form, there develops a fever accompanied by sweating, a very abundant flow of urine, and salivation, without tenderness or ulceration of the gums. Epigastric heat and oppression, headache, dryness of mouth and throat, with gastrointestinal irritation.

Treatment of Acute Poisoning by Gold.

—The principles of treatment are the same as poisoning by corrosive sublimate. The contents of the stomach should be evacuated after the free administration of albumin, eggs, milk, and flour. External heat should be applied and stimulants administered by the mouth, the rectum, or by hypodermic injection. Morphine is useful if shock be present. Atropine will diminish the salivary secretion, and astringent (tannin) or dilute-acid mouth-washes will relieve the salivary symptoms.

Therapeutics.—The preparations of gold are not as much in favor as formerly.

Nervous dyspepsia is relieved by small doses ($\frac{1}{60}$ to $\frac{1}{24}$ grain) given three times daily. Mills regards it as a valuable tonic in hysteria and other disorders dependent upon depravity of the nervous system.

NEPHRITIS.—In diseases of the internal organs associated with sclerosis, as nephritis, cirrhosis of the liver, etc., the persistent use of gold and sodium chloride has given excellent results. In contracted kidney a pill of chloride of gold has been recommended by Dana.

PTHISIS.—Gibbs and Shurley, of Detroit, laboring under the impression that gold and sodium chloride possessed bactericidal powers in this disease reported a number of cases in which satisfactory results were obtained.

SYPHILIS.—In old secondary and tertiary cases where mercurials and the iodides have been long in use, gold will yield beneficial results, as in gummata, syphilitic pharyngeal ulcerations, specific ozæna, etc. Ingals has found chloride valuable in syphilitic laryngitis. Hale White finds the sodium chloride preferable to corrosive sublimate in the tertiary form, especially when the osseous system is involved.

EFFUSIONS.—Gold has yielded good results in ascites due to chronic hepatitis, post-scarlatinal dropsy, and in ovarian dropsy.

GYNÆCOLOGICAL DISORDERS.—Amenorrhœa, sterility due to coldness, ovarian torpor, and the tendency to habitual abortion have been benefited by the use of chloride of gold.

MENTAL DISORDERS.—Good results have been obtained from the use of gold in melancholia and hypochondria accompanied by depression. Vertigo, when due to gastric disturbance, is often relieved by small doses of gold chloride, but when cerebral congestion or plethora

is present, the use of gold is contra-indicated.

INEBRIETY.—Chloride of gold has been recommended in the treatment of chronic alcoholism (see **ALCOHOLISM**, volume i).

Gold, whose effects are unknown and even to its defenders are surrounded by mystery, cannot possibly be of any service in checking an unknown disorder. Its use must be empiric and irrational always, except as a mental remedy to influence the mind. The checking of the drink symptom is the same as using opium for pain, leaving the cause uninfluenced. Gold or any single drug can have no specific influence in cases of inebriety. T. D. Crothers (*Jour. Amer. Med. Assoc.*, Oct. 1, '98).

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GONORRHOEA. See **URINARY SYSTEM**, **SURGICAL DISEASES OF**.

GONORRHOEAL ARTHRITIS. See **RHEUMATISM**, **GONORRHOEAL**.

GONORRHOEAL OPHTHALMIA. See **CONJUNCTIVA**, **DISEASES OF**.

GONORRHOEAL RHEUMATISM. See **RHEUMATISM**, **GONORRHOEAL**.

GONORRHOEAL VAGINITIS. See **VAGINA**, **DISEASES OF**.

GOUT.

Synonyms.—Podagra; arthritis urica.

Definition.—Gout is a constitutional disease manifesting itself in various ways and attacking various tissues and parts of the body, but most frequently the articulations. It occurs in an acute and a chronic form, both of which are characterized by the deposit of urates in the affected parts.

Symptoms.—An attack of acute gout may occur without any precursory symp-

tom in persons who, before, felt quite well; but this mode of development is not usual. Generally, premonitory signs are experienced some time in advance, especially in the digestive and circulatory system and in the kidneys. The patients have frequently led a luxurious life, have been accustomed to excessive consumption of food, especially of animal food, have indulged in alcoholic drinks, and taken little or no exercise. They are often obese, with red and flushed face, complain of heart-burn, sour eructations, flatulency, and other indications of a dyspeptic derangement.

[Another form of gout—poor gout—is met with in persons living badly and exposed to cold and dampness; these patients are ordinarily lean, with sallow faces. F. LEVISON.]

Immediately before an attack of acute gout the dyspeptic symptoms become aggravated; the bowels are obstinately confined; hæmorrhoidal pain and hæmorrhage is observed. The patients complain of headache, vertigo, drowsiness; sleep is disturbed by pain or cramps in the calves and elsewhere; there is pain in various articulations; paræsthetic sensations, such as numbness of the fingers, chilliness, etc.

Irregularity of the action of the heart is often observed and the pulse is ordinarily firm and tense; the morbid state of the nervous system manifests itself by mental depression, irritability, bad temper; severe neuralgia is a frequent precursory symptom, and severe pains of the lumbar region are frequently complained of. In spite of all these manifestations, the appetite is generally good and the venereal desire is frequently increased. The urine is in most cases concentrated and scanty; in others the micturition is free, acid, and abundant, the urine being clear and watery. Just before the attack all the precursory symp-

toms commonly disappear and a general sense of well-being may be experienced.

Although some of these precursory symptoms are observed in most cases, an attack of gout may well occur without warning; when the first attack sets in the patient may believe that he suffers from a sprain of the affected joint or that the pain is of rheumatic nature and only by repetition of the attack does the real nature of the disease become apparent.

In the majority of cases of acute gout the metatarsal phalangeal joint of the great toe is the articulation first attacked; generally on one side, but sometimes on both; in subsequent attacks other articulations become involved either of the foot (podagra) or of the hand (chiragra). Almost all articulations may successively or simultaneously be affected, even the articulations of the jaw and of the spine; the hip-joint and the shoulder-blade are very rarely affected.

The attack itself has been vividly described by Scudamore, Sydenham, and other classics of gout: "The patient has gone to bed without any particular disturbance of health and often feels better than for some time; after some hours' sleep he is awakened, ordinarily between 12 and 3 o'clock, by a very intense pain in the great toe. The attack sometimes begins with a slight rigor. The pain soon increases to complete agony, there is much restlessness, and in vain some relief is sought by changing the position of the foot. The patient complains of extreme tension and throbbing in the affected joint; the pain, which has been compared to that caused by a tightly-drawn thumb-screw, is aggravated by the slightest touch or vibration, and becomes so intense that nothing at all like it occurs in any other joint-disease.

"After some hours of this excruciating pain, some relief is obtained, coming

gradually or quite suddenly, perspiration occurs, and sleep follows. On the following day the affected joint is found swelled, red, tense, shining, and tender. Some pain continues all the day, and toward evening it becomes aggravated, reaching almost the same intensity as in the preceding night." The temperature is somewhat elevated; it reaches 102° F., but seldom higher; the pulse varies from 80 to 100.

For some days the symptoms may recur in the same manner, then some oedema appears around the affected joint, and successively increases to the fourth or fifth day, when the pain finally commences to decline; the swelling of the affected joint then diminishes, and this is commonly followed by cracking and peeling off of the cuticle: a process accompanied by intense itching. When the great toe-joint or similar small articulations are affected no effusion in the joint can be felt; when larger articulations, such as the knee-joint, are attacked, this sign is frequently observed.

During the attack there is commonly thirst, but no appetite; the patient feels even aversion to solid food and some nausea; vomiting very rarely occurs; the tongue is furred and the bowels constipated, or there may be some pale and offensive stools. The urine is scanty, concentrated, and a copious sediment of urates and uric-acid crystals is precipitated.

When the attack has passed away, the patient often feels better than before it; some weakness, tenderness, and stiffness of the affected joint remains for some days, then complete recovery is established. The duration of the whole attack varies from six to ten days, and may even reach some weeks; in that case there are numerous remissions and exacerbations of the attack.

All attacks of acute gout do not, however, pass off suddenly; they may supervene gradually and increase in severity until they reach the true classical form. Sometimes the first attack is more violent, but as the malady progresses the accesses become more prolonged and are not so painful; at first the attack generally comes on once a year,—in the spring; then twice a year,—in spring and autumn; afterward at more irregular intervals. Only rarely does the malady show itself by one attack only; that may occur when the patient alters his whole manner of life, renounces the use of alcoholic stimulants, lives on very frugal diet, etc.

As the attacks become more frequent, asthenia increases, the pain is less violent, the duration of the access is longer, the stiffness of the affected joints does not completely disappear, and they remain enlarged, red, and tender even after the attack has passed away; smaller or larger hard nodules (*tophi*) are found in the tissues around the joints and elsewhere,—the case is passing over in the chronic stage.

As already stated, the first attack of acute gout ordinarily affects the metatarso-phalangeal articulation of the great toe; in some cases the knee or the elbow-joint is attacked at the onset. Garrod and other authors state that an injury, such as a sprain or a contusion, may determine the localization of the gouty process to the injured joint. Charcot observed that the articulations of paralyzed extremities were particularly liable to be involved by gout.

CHRONIC GOUT.—Chronic gout may occur as the result of a long series of acute attacks which gradually have weakened the constitution of the patient, or it may appear in feeble subjects as the only manifestation of gout. In both

cases the joints successively get enlarged, deformed, stiff,—even immovable,—nodulated, owing to the deposition of urates in their structure. The skin covering them is congested and thin, with large, blue veins; ultimately it may rupture, and discharge whole chalky masses of urates,—*tophi*,—sometimes followed by suppuration and ulceration. The deformities of hand and foot are caused by partial dislocations of the phalanges, with deflection of the fingers in various

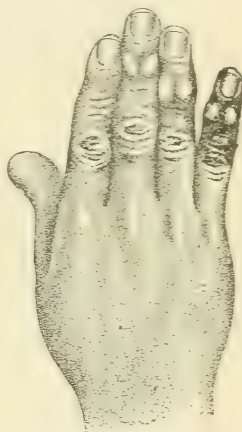


Fig. 1.—Gouty fingers. (*Pfeiffer.*)

directions: when the affected articulations are moved, a scraping sound is heard and felt. In the most advanced cases not only fingers and toes, but also wrist and elbow, ankle-joint, and knee are stiff and deformed, and at last the patient may be obliged to remain immovable in his chair or in his bed as an impotent cripple.

In chronic gout urates may be deposited in different structures, such as tendons (especially the *tendo Achillis*), bursæ, aponeuroses, and periosteum; in

the cartilages tophi may be found, very frequently in the ear, but also in the eyelids and on the nose. These tophi are generally of the size of a pin's head or a bead; at first they contain a whitish fluid containing crystals of urate; ultimately they become solid and form small, hard nodules.

2. Fibroid thickenings and little lumps in the hands of those who suffer from gout.

3. Fibroid thickening of bursæ.

4. Gelatinous deposits, sometimes diffused and sometimes nodular. These are much softer than the fibroid variety.

5. The rheumatic nodules of Barlow.

6. The nodules met with in sclero-

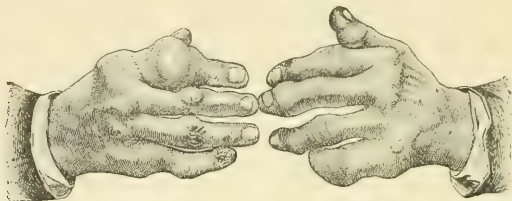


Fig. 2.—Gouty fingers. (Pfeiffer.)

Finger-nodes are divisible into two classes: In one class the nodosities are true osseous enlargements, and are of rheumatic origin; in the other class the nodes are composed of urate-of-soda deposits and are connected with the true gouty diathesis. The outward appearances are illustrated by the accompanying cuts (Figs. 1 and 2), while the osseous enlargement of the ends of the bones

derma. These are similar to the "rheumatic nodules," and possibly identical with them.

7. The lumps which often accompany Dupuytren's contraction of palmar fascia.

8. Lumps developed in tendons. These occur most frequently in the tendo Achillis. It is sometimes difficult to tell whether they are syphilitic or gouty in origin.

9. The indurations in the skin of the hands, which constitute the "Judson Bury" group. These occur with inherited gout.

10. The livid indurations in the skin which have been described in sarcoma melanodes. These occur in adults with inherited or acquired gout. J. Hutchinson (Hutchinson's Archives of Surg., Apr., '96).

Personal examinations of gouty tophi have shown that the deposit was composed, not of urates, but of calcium phosphate and carbonate with some calcium sulphate. The acidity of the urine was also found but one-third the normal. When, therefore, hyperacidity exists, the gouty deposits are tribasic calcium phosphate. The tophi are increased by the administration of large quantities of alkalis. Morel-Lavallée (Jour. des Praticiens, May 25, 1901).

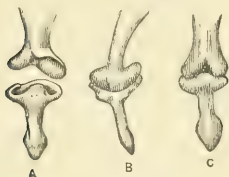


Fig. 3.—Osseous enlargement in gout. *A* represents the phalanges from the back, and *B* the side-view. For purposes of comparison a delineation is given of the dorsal surface of a normal phalangeal joint,—shown in *C*. (Pfeiffer.)

in the rheumatoid cases is seen in Fig. 3. Emil Pfeiffer (Lancet, Apr. 11, '91).

Varieties of nodules that may be met with:—

1. Non-calcareous nodules in the ears in the subjects of declared gout.

In the skin tophi are more rarely found, but have been observed in the face. The urine in chronic gout is ordinarily pale and watery, sometimes slightly albuminous, and commonly abundant; it contains always casts of renal tubuli, hyaline or granulated. The patients are weak and pale, suffering from disorders of digestion; they are subject to cramps, neuralgias, and other nervous disorders.

IRREGULAR GOUT.—Besides the symptoms directly dependent on or associated with the deposition of urates in the articulations and in other structures, many morbid symptoms have been observed in the course of gout and have more or less correctly been named symptoms of irregular gout; these symptoms may alternate with the regular attacks, and their gravity is frequently in inverse proportion to the violence of the true gouty attacks. Symptoms of irregular gout may occur,—an imperfect development of the attack, or suppressed gout,—or when inflammation of the joint from some cause or other (improper treatment) unduly subsides,—retrocedent gout.

Almost all internal organs may become the seat of disorders which have been ascribed to gout.

Case of obstinate gout in which, during the attack (the disease involved the penis), continuous priapism resulted, which lasted for twenty-one days. Pathology of the attack believed to be thrombosis in the corpora cavernosa. D. Duckworth (*Brit. Med. Jour.*, Jan. 16, '92).

The absence of excessive heat in joints affected with gout and the fact that some observers have found such joints lower in temperature than surrounding parts, together with the early turgescence of the veins, the redness, and the pain, indicate that the cause of the attack is thrombosis of the vessels about the joints. Balfour (*Edinburgh Med. Jour.*, June, '98).

The gouty kidney presents the same signs as the ordinary granular-atrophic kidney, and cannot be distinguished from it, neither by the symptoms nor by the anatomical examination. It will be shown later on that a certain degree of granular atrophy of the kidney is found in all cases of gout; when the renal changes are fully developed, the urine becomes clear and watery, contains urea and uric acid and in deficient quantity, and the patients may die from renal insufficiency. Gouty persons often suffer from gravel and calculosis; oxaluria is frequently met with; chronic cystitis and urethritis may be observed, especially in old persons suffering from gout.

In the direction of the nervous system many symptoms of morbid derangement may be observed, such as headache, hemiplegia, vertigo, fainting, sudden delirium, mental depression, epileptic fits, and apoplectic attacks. All kinds of neuralgia, especially gouty sciatica and costal neuralgia, have been described, and symptoms of disorders of the spinal cord and the meninges and paresis or paræsthesia at the peripheral nerves have also been noted.

The vascular disorders are generally caused by atheromatous changes of the large vessels and followed by hypertrophy and fatty degeneration of the heart. Severe palpitations, intermittent and irregular cardiac action, and weak, very slow or rapid pulse are frequent symptoms in gout. There may be dyspnoea and a feeling of constriction, and true attacks of angina pectoris are not uncommon. Phlebitis, especially of a recurrent form, has been observed among the symptoms of gout by competent observers.

Although the digestive system is very commonly deranged, the stomach and the bowels are not liable to specific gouty

changes; fatty liver and a tendency to cholelithiasis is frequently observed; severe pain in the stomach or in the bowels may occur, but these seem to be of neuritic origin.

The skin is frequently affected. Among the diseases of the skin allied to gout may be named erythema, eczema, urticaria, psoriasis, prurigo, and acne.

A patch of eczema, of spontaneous development, signifies the existence, in the person possessing it, of a gouty diathesis. As it happens, the floor of the external auditory canal is apt to be the first spot on the surface of the body where an eczematous inflammation develops. This condition constitutes a valuable guide-post, pointing, as it does, at a very early stage to the existence of a gouty diathesis. A. H. Buck (*Amer. Jour. Med. Sci.*, Mar., '98).

Bronchitis and asthma are often met with in gouty patients; there seems to be a certain antagonism between gout and tuberculosis; at least, it has been asserted by many authors that tuberculous changes develop very slowly in gouty patients.

Persons affected with gout rarely become tuberculous, and some patients with tuberculosis have had that disease decidedly checked on the supervention of an attack of gout, because uric acid and urates are antagonistic, not only to the pyogenic micro-organisms, but to the bacillus tuberculosis. Mollière (*Le Bull. Méd.*, No. 18, '88).

Obesity and diabetes mellitus are often associated with gout. Uric deposits have been found in the cornea and conjunctiva; uratic keratitis and iritis and gouty inflammation of the vitreous body have been observed.

Case of a gouty patient, of 54 years, who presented, in the anterior elastic lamina and in the proper tissue of each cornea, several opaque foci, connected by anastomosing lines. These opacities were proved to be due to a deposit of

urate of soda. Chevallereau (*Recueil d'Ophthal.*, Apr., '91).

Following conclusions reached after careful study of five cases of gouty retinitis and neuroretinitis: 1. The changes in the fundus are always bilateral, though rarely symmetrical in the two eyes. 2. The degeneration in the walls of the blood-vessels and in the retina cause marked impairment of central vision, little or no loss of peripheral vision, and never end in blindness. 3. The loss of central vision is always progressive up to a certain point, unless the cause of the lesion is recognized early in the onset and immediately and properly handled. Improvement in the vision after the disease is established cannot be expected. 4. Hæmorrhages into the retina are rare except in the early stage of the disease. 5. The most marked feature in the fundus is the development of arteriosclerosis and phlebosclerosis. 6. Another almost equally pathognomonic symptom is the peculiar, yellowish, granular exudation in the retina, located by the ophthalmoscope around the posterior pole of the eye and generally leaving the macula intact. 7. The changes in the optic-nerve fibres seem to be almost entirely intra-ocular, and cannot be traced for any great distance back of the eyeball. Bull (*N. Y. Med. Jour.*, Aug. 12, '93).

Gouty eye diseases occur intermittently, often once a year,—are very painful, but subside completely after a time. The subjects are usually adult men, who, though not liable to gout, have suffered from sciatica and the like. A somewhat peculiar form of destructive iritis, usually symmetrical, is occasionally met with in women who inherit gouty tendencies and have arrived at the climacteric period. It is sometimes almost painless. In men, the subjects of acquired gout, we sometimes see acute and very painful ulceration of the margin of the cornea of a definitely gouty nature, and curable by treatment suited to that diagnosis. Jonathan Hutchinson (*Archives of Surg.*, July, '95).

The changes induced by the gouty diathesis may consist in seroplastic inflammations, with or without perceptible

excretion of uric acid. As examples are reported cases of scleritis, iridocyclitis with deposits between the choroid and retina, nodules within the sclera, and one typical instance of episcleritis periodica fugax. Moreover, gout may be the indirect cause of ocular affections, especially in consequence of certain vascular changes, particularly precocious atheroma. To this category belong cases of severe relapsing disease of the vitreous humor, which finally leads to cataract, detachment of the retina, and retinitis hæmorrhagica. Certain sclerotizing affections of the cornea come under the same head. Some cases of glaucoma exhibit a relationship to gout. Wagenmann (*Deutsche med. Woch.*, No. 36, '96).

A frequent lesion is an insidious variety of exudative choroiditis, which appears under the clinical picture of so-called serous iritis or iridochoroiditis, usually occurring during the intervals between acute attacks.

Of all the obscure ocular lesions caused by an outbreak of gout this is the most treacherous.

This lesion of the uveal tract is the most frequent expression of the gouty diathesis.

Another less frequent lesion is iritis, associated with zona ophthalmica, or herpes zoster of the eye.

Another rare expression of gouty diathesis appears under the guise of a low grade of iritis, or of the iridochoroiditis referred to, the process being secondary to degenerative changes which affect the retina, and finally resulting in glaucoma.

The gouty diathesis is also one of the causes of glaucoma. Robert Sattler (*Med. News*, Jan. 22, '98).

When uratic deposits occur in the mastoid cells or in the *cæcum tympani* they may cause deafness.

Gout is a cause of ear disease, especially producing earache at night and tinnitus aurium without deafness. A Baum (*Phila. Polyclinic*, July 24, '97).

Rhinitis and parotitis urica have been mentioned, and also xerostomia, *i.e.*, extreme dryness of tongue and mouth

lasting for months. Angina and *œsophagismus* have likewise been noted.

Attention directed to the frequent connection between gout and irritation of the mucous membrane, more especially as seen in hay fever and chronic nasal and pharyngeal inflammations. William Davis (*Omaha Clinic*, Apr., '92).

The symptoms of gouty affections of the throat are very similar to rheumatic affections, though the pain may be more intense. Small tophi have been seen on the vocal cords and at the cricoarytenoid joint, though this condition is exceedingly rare. Gouty deposits in the laryngeal mucous membrane have been diagnosed as cancer. Watson Williams (*Laryngoscope*, Apr., '98).

The urine of gouty patients is of varying aspect and nature; in persons disposed to gout the urine is ordinarily concentrated, loaded with urates, and a sediment of urates and uric acid is deposited; during the gouty attack the urine presents commonly the same character. In other cases the urine is pale and watery; there is diminution of its principal components, and traces of albumin may be found. In "poor gout" and in chronic cases which have weakened the constitution of the patient the watery, pale urine is frequently observed.

From the investigations of Vogel, Schmoll, Laquer, and Magnus-Levy it appears that before the attack and in the free intervals between them nitrogen is constantly retained in the body, whereas during the attack this is reversed, urea and also uric acid (His, Pfeiffer) being excreted at this period in quantities even exceeding the normal.

Persons suffering with gout, acute or chronic, have almost an immediate precipitation in the urine after passing it. If this precipitate is examined chemically, it will be found to differ from uric acid in its ultimate composition. This acid is only found in the urine during an attack of gout, and always in a free or uncombined state, while the uric acid

remains in the urine as a urate and in solution. To this acid, and not to uric acid, the attack of gout is due. C. J. Rademacher (*Amer. Pract. and News*, June 21, '90).

It is only the great proneness of the urine of persons subject to gout to part with its uric acid which is characteristic of that disorder, and not the mere abstraction itself. While from 3 $\frac{1}{8}$ ounces of the urine of healthy persons 30 to 45 grains of uric acid are obtained, from the urine of gouty persons the same quantity of urine only produces 3 to 7 $\frac{1}{2}$ grains. Emil Pfeiffer (*Lancet*, Jan. 3, '91).

Excretion of the alloxuric bodies (uric acid and xanthin bases) in gouty patients does not exceed that for the normal person unless possibly at the onset of an acute attack. Rommel (*Zeitschrift f. klin. Med.*, B. 30, H. 1 and 2).

Although there is some increase of the alloxuric substances in the urine during acute attacks of gout, this increase does not overstep the physiological limits. Malfatti (*Wiener klin. Woch.*, vol. ix, p. 723, '96).

In gout no increase of the alloxuric substances at all found, and the relation between the excretion of uric acid and xanthin bases was normal. E. Schmoll (*Zeits. f. klin. Med.*, xxix, p. 510, '96).

Inability to confirm the statement that in gout the amount of the xanthin bases and uric acid together is increased, or that there is any constant relative excess of the xanthin bases as compared to the uric acid. Laquer (*Verhandlungen des Cong. f. innere Med.*, vol. xiv, p. 333, '96).

The deposit of uric acid in the joints is only a symptom, as is also the increase of uric acid in the blood. It occurs secondarily to a necrosis of retained substances, alloxur compounds, particularly adenin, circulating in the blood. Before the outbreak of an attack of gout there is a retention of nitrogen in the system. This is to be credited to the presence of nitrogenous extractives of the alloxur or uric-acid group. The adenin is the most harmful, producing necrosis of the tissue-cells. O. Hager (*Münchener med. Woch.*, Aug. 7, 1900).

As already mentioned, a slight albuminuria may be occasionally found; but, even if that be not the case, symptoms of a disease of the kidneys are never failing in gout. I have examined many samples of urine from gouty patients and found that by the use of a centrifugal apparatus and a microscope I was always able to detect hyaline and granular casts in it, and am of the opinion that this indication of a morbid state of the kidneys is a constant symptom of all stages of gout.

Diagnosis.—The diagnosis of a typical attack of gout is easy not only as regards the localization of the morbid process, but also as to the development of the affection. Chronic gout may be confounded with other chronic affections of the joints of gonorrhœal, tuberculous, or neuropathic origin. Generally the diagnosis is facilitated by the clinical history of the complaint and by the examination of the affected articulation.

RHEUMATOID ARTHRITIS.—It may in many cases be difficult to distinguish between the chronic gouty affection of a joint and the morbid change caused by rheumatoid arthritis,—or, as it is more properly called, the polyarthritis deformans,—which disease attacks the cartilages, as well as the bone, and leads to destruction of the cartilage, to proliferation and thickening of the ligaments, and frequently to growths of osseous protuberances. In this malady there is no trace of uratic deposits.

The chief points of difference between gout and polyarthritis deformans are the following: In gout hereditary predisposition is commonly observed; the disease occurs more frequently in the latter classes than among the poor; it is most prevalent among males; in the clinical history there is often a record of abuse of alcoholic stimulants, beer, or strong

wines; the patient may suffer from lead poisoning.

The estimation of the amount of uric acid in the urine before, during, and after an attack of gout is of no value unless the amount of that substance taken in with the food is estimated. The power to destroy uric acid ingested as food is lowered in gouty subjects. If a gouty subject is given a weighed quantity of uric acid and then excretes more uric acid than he should from the amount taken in, the result may be of diagnostic importance. A. C. Croftan (*Phila. Med. Jour.*, June 21, 1902).

In many cases the appearance of gout has been preceded by repeated attacks of renal colic or by long-continued evacuations of uric-acid sand in the urine.

Thirty-four cases of gout compared with 49 cases of rheumatism. In the former the attack is more apt to be mon-articular, the pulse is almost invariably of high tension, tophi can be occasionally observed, and in all cases of inflammation of the joints the points of greatest tenderness to pressure were the condyles or malleoli. In the latter disease the pulse is most frequently of low tension; the heart is commonly affected; a number of cases exhibit tonsillitis or pleurisy, and the first attack is nearly always polyarticular. When the joint is acutely inflamed there is much more superficial tenderness, and at the same time there are points of special sensitiveness, usually situated over the tendons in most immediate relation to the joints. When the hips and shoulders are affected it is exceedingly difficult to make out special points of tenderness in either condition. W. H. Thomson (*Amer. Jour. Med. Sci.*, Aug., '96).

Frequently (but by no means always) gout begins with an acute attack; tophi may be found on the external ear or elsewhere. The urine is usually found deficient in urea and uric acid by treating it in the centrifugal apparatus, while by examination of the sediment with the microscope, casts of the tubuli, hyaline or granular, will always be detected in

quantities more or less great. After the discovery of Roentgen the X-rays have been used as a diagnostic means; various investigators, especially French, have demonstrated that the uric-acid compounds offer no resistance to the X-rays. In a Roentgen photogram of a hand or foot affected by gout the clear lines between the bones indicating the articulations appear quite unaltered, and the extremity resembles very much a healthy extremity and differs only from it by the enlarged outlines of the fingers and toes. Greater deposits, such as tophi, are quite invisible in Roentgen photograms. The reproduction of a hand or foot affected by polyarthritis deformans presents quite a different aspect; all the articulations affected by the disease, even if it be not developed far enough to cause stiffness or enlargement of the joint, have lost their clear, transparent appearance, and are of an obscure, almost black, color. When the joint has been affected for some time, it is absolutely impossible to discern the exact place of the articulation, the bones seem soldered together, and that even in cases where a rather good mobility of the articulation still exists.

When all these facts are united, the clinical story, the examination of the joint and of the urine, and the aspect of the Roentgen photogram of the affected parts, the diagnosis will in most cases offer no insuperable difficulty.

Etiology and Pathogeny.—Gout is a markedly-hereditary disease affecting men much more frequently than women. As it often occurs in subjects having presented indubitable signs of gravel or uric-acid calculi, it seems to be in some way related to that complaint; it has often been observed that, in a family disposed by inheritance to gout, cases of this malady alternate with cases of uric-

acid gravel or calculi; hence the conclusion was drawn that both diseases had a common origin: the uric-acid diathesis.

Developed gout is rarely met with before the thirtieth and fortieth years; it begins rarely after the forty-fifth year, but may in hereditary cases even affect children.

Persons who live freely, eat much meat, indulge in alcoholic drinks, and take little or no exercise are most subject to the disease; but it may also be observed in nervous, lean, underfed subjects, especially when they take much ale or porter and by their employment are exposed to cold and dampness. All sorts of excesses and overwork, bodily or mental, seem to be apt to provoke the attack of gout. Sydenham states that he always had an attack of gout following prolonged mental labor.

Workmen employed in lead-mills, painters, plumbers, and all persons exposed to absorption of lead are extremely disposed to be attacked by gout. (Garrod, Lancereaux, and others.)

At the Johns Hopkins Hospital in the past thirteen years 36 cases of gout have been treated,—0.24 per cent. of all medical cases. In London gout constitutes 0.37 per cent. of medical cases in St. Bartholomew's Hospital. In America heredity does not seem to be active in the etiology of the condition. On the other hand, alcohol is an active factor, particularly the fermented liquors. Lead poisoning is also an important condition in the etiology. Twenty-seven of the 36 patients reported were native Americans. All the patients were males, the majority of whom were in the lower walks of life. Before the acute symptoms of the attack begin the excretion of uric acid is below normal; and late in the attack and in the intervals of the attack the output of uric acid is very low. The excretion of phosphoric acid is parallel to that of uric acid. Tophi were usually present, most frequently in the ears. There were definite evi-

dences of arteriosclerosis in 23 cases; in 14 cases the specific gravity of the urine was low; albumin was present in 27 cases and in 23 cases casts were found. These facts indicate that in a large proportion of the cases chronic interstitial nephritis was present. The occurrence of a uric acid sediment in the urine does not indicate a gouty tendency, as is so commonly supposed. There was no such sediment in any of the 36 cases treated. Tophi are important in the diagnosis of gout; they should contain crystals of sodium urate. T. B. Fletcher (Phila. Med. Jour., June 21, 1902).

The disease prevails chiefly in cold and temperate climates, especially when the latter is at the same time damp and changeable; gout may, however, be found also in countries where the climate is warm and equal. Cantani found it to be not uncommon in Naples, and it is frequently observed among the Arabs of Algiers.

Indulgence in alcoholic drinks and excessive consumption of animal food predisposes to gout; it has therefore been called a disease of the well-to-do classes. Of alcoholic drinks, wines containing a large percentage of alcohol—such as sherry, port, and champagne—have the worst effect; the lighter wines, as claret or Rhine wine—are not so hurtful. Among the malt-liquors ale and porter are reputed to be much more conducive to the development of gout than the lighter kinds of beer; distilled alcoholic beverages—such as gin, brandy, and whisky—are by many authors believed to be less liable to cause the development of gout than beer or strong wine.

Although gout is a malady which has been known to physicians for thousands of years, its pathogeny and real nature is still a subject of debate.

As already stated, the deposition of urates in different structures is the most characteristic feature of gout; the origin

of these deposits has consequently been investigated by many observers.

Garrod, in his celebrated work on gout, demonstrated that the blood of gouty patients contains more uric acid than in the normal state.

[This was done by mixing a few cubic centimetres of blood-serum or fluid from a blister with 10 or 12 drops of acetic acid. Threads of cotton were placed in this mixture; this was covered by a watch-glass and left alone for from twenty-four to forty-eight hours. After that space of time the thread was thickly covered with characteristic crystals of uric acid, when the blood was taken from a gouty patient, especially immediately before an attack. The blood of healthy persons or of patients suffering from diseases not accompanied by uricæmia does not give the same results. F. LEVISON.]

The experiments of Garrod have been repeated by other observers, and it is now generally accepted that in gout, uric acid, in the form of urate of soda, is found in the blood in excess. Different questions now arise: How and where in the body is the uric acid formed and what is its physiological significance? Which is the uric-acid compound circulating in the blood and excreted in the urine, and how are these deposited to form tophi, etc.? What is the origin of the uricæmia in gout, and, if uric acid may also be found in excess in the blood in other diseases, why are deposits of uric-acid compounds only formed in gout?

The first question was, until the last few years, generally answered by the statement that uric acid, as well as urea, were products of the metabolism of proteids; the normal result of the complete oxidation of these was urea, only a small amount of proteids being left in a state of lower oxidation and excreted as uric acid. In some persons suffering from a slow and incomplete metabolism—retar-

dation of metabolism—the oxidation of proteids was less perfect, and a larger quantity of uric acid was formed than in health.

The endogenous purins are increased by the administration of sodium salicylate, and this increase does not arise from excessive cell destruction, but probably from diminished destruction of already-formed uric acid.

The exogenous purins are metabolized by gouty patients almost as well as by normal individuals, any slight retention being due to increased capillary pressure and subsequent slowing of the lymph stream, and not to the formation of abnormal compounds.

The endogenous purin in gouty individuals may possess peculiar affinities and combine with abnormal products of proteid metabolism. The presence of constipation in gouty patients is accompanied by an increased output of uric acid, this excess, however, apparently arising from diminished destruction of the formed uric acid. I. W. Hall (Brit. Med. Jour., Sept. 24, 1904).

Much labor has been spent in calculating the normal proportion of uric acid as to urea in the urine; this has been established by Haig as 1 to 33. According to this author, every departure from this proportion is pathological.

The old theory of the pathogenesis of gout contended that, when retardation of metabolism took place, much more uric acid than normally was formed; the uric acid accumulated in the blood, and when the blood had thus been loaded with the compounds of uric acid, it deposited them in the articulations, etc.

This theory has been overthrown by recent investigations. Kossel, Horbaczewski, and many other investigators have shown that uric acid is not a product of the metabolism of the proteids, but that it is formed by the oxidation of nuclein—an albuminous compound which differs from the proteids in that it contains a greater proportion of phos-

phorus. The nuclein is contained in the nuclei of cells, and may be prepared from all cellular structures, such as the spleen, the thymus gland, etc.

It has further been demonstrated by many experiments that the excretion of uric acid in the urine is increased or diminished by all factors (diseases, medicines, poisons, etc.) which give rise to a more rapid or slower disintegration of the cellular elements of the body and especially of the leucocytes. The ingestion of food causes a temporary leucocytosis (digestive) followed by an increase of the formation and excretion of uric acid. The amount of uric acid excreted in twenty-four hours is not much influenced by the nature of the food (animal or vegetable); there is, however, this distinction noticeable: that the more easily digestible animal proteids set up digestive leucocytosis and formation of uric acid much quicker than the vegetable albumins, which are difficult to digest.

The theory must be considered as proved which attributes the formation of uric acid in the body to a process of *leucolysis*, following on a leucocytosis. A review of the literature upon tissue-necrosis in gout leads the writer to state definitely that the process is caused by a poison, probably a nucleic acid, acting in a similar way to that in which tissue-necrosis is caused by lead in plumbism. Froelich (Jour. Amer. Med. Assoc., Jan. 3, '97).

Both chemico-physiological and clinical evidence point clearly to a defective oxidation as the chief predisposing factor in causing the pathological lesions of rheumatism and gout. This may be due to taking into the body more oxidizable food-products than the normal system can fully oxidize, or a diminution in food, especially of a poor quality, may result in malnutrition and anæmia such that the food does not encounter sufficient oxygen for its perfect reduction. W. H. Porter (N. Y. Med. Jour., Mar. 24, 1900).

While it is easy to increase the quantity of urea excreted in twenty-four hours by the ingestion of large quantities of proteids, the excretion of uric acid is not much influenced in that way. Weintraub, Umber, and Kühne have demonstrated that the excretion of uric acid may be increased to 2 or 2.5 grammes in twenty-four hours by giving large quantities of nuclein,—for instance, 500 grammes of the thymus gland,—whereas the normal excretion of uric acid varies from 0.4 to 1 gramme per day.

The augmented formation of uric acid will, of course, lead to a temporary uricæmia, which usually does not cause any morbid symptoms, but is only characterized by an extraordinary increase of the excretion of uric-acid compounds in the urine.

By chemical investigation of the gouty deposits, these have been found to consist of an acid compound of uric acid with soda, the so-called biurate, and it has commonly been stated that this was also the composition of uric acid circulating with the blood. Roberts has recently thoroughly investigated this question.

[Roberts's results have quite overthrown this theory. In text-books on chemistry, uric acid $U = (C_5H_3N_4O_6)$ is described as a dibasic acid, which can form a neutral (M_2U) salt and an acid salt biurate (MHU). The neutral salt can only be prepared by dissolving pure uric acid in a solution of caustic soda and evaporating to dryness, without the entrance of air. It can never exist in the body and we need not refer to it again. The biurate is the chief component of the tophi and was supposed also to be contained in the blood and the urine, and under circumstances to be precipitated as a brick-dust deposit. By examining this sediment Roberts found it to be an unstable compound which easily decomposes into uric acid and a soluble compound; by chemical investigations of

different order it was demonstrated that the deposit formed by the urine cannot be regarded as a biurate, but is a quadriurate: *i.e.*, a compound of four equivalents of uric acid with one equivalent of soda or potash; its chemical formula is consequently H_2u, MHu . This quadriurate is a very unstable compound, liable to be decomposed into biurate and uric acid; this decomposition is effected by adding distilled water to the sediment and by many other fluids. The gouty tophi consist of biurate, but this salt is almost insoluble in serum,—even, at the body-temperature, only in the proportion of 1 in 10,000. F. LEVISON.]

The researches of Roberts establish that, normally, uric acid exists in the blood as a quadriurate; under special circumstances the quadriurate may be transformed in the blood to a biurate, which gives rise to the deposition of this compound in different parts of the body; the more uric acid is dissolved, the more quickly occurs the formation and deposit of biurate, but in all cases the uric acid cannot remain long in solution; if it is not quickly eliminated by the kidneys, transformation of the quadriurate and deposition of biurate is the consequence.

In serum rich in soda salts the biurate crystals are more easily separated than usual; irrespective of the acid with which they are combined, the salts of lime and magnesia, of lithia and piperazin do not affect the rapidity and the degree of deposition, whereas all salts of potash delay the deposition of crystals of biurate from blood-serum.

The granular urate is always the precursor of the crystalline form, and in the body-fluids the uric acid circulates in the form of invisible granules of sodium urate.

Gouty deposits are only met with in non-vascular tissues, and, as acids and acid salts diffuse more rapidly and readily than alkalies and alkaline salts, we must suppose that the alkalinity of the non-vascular tissues is less than that of

the blood. Hence if a transudate almost saturated with urate enters such a less alkaline tissue, the solution becomes supersaturated and granular urate is precipitated in the tissue, the precipitation being favored by such additional factors as lowered temperature or increased concentration of the fluids of the tissue. The precipitation of the granular urate in the spaces of the interstitial tissue and in the lymph-channels is the cause of the various phenomena of gout. In the course of time the urate deposited becomes converted into acicular crystals of sodium biurate, or, under favorable conditions, may be redissolved and disappear, and with them disappear the lesions to which they gave rise. Mordhorst (*Zeits. f. klin. Med.*, p. 65, '97).

Gout defined as a constitutional disease of nutrition, most often hereditary, characterized by a dyscrasia termed uricæmia, causing a series of manifestations called arthritic and inflammations, of the joints especially, with the deposit of uric acid at the spots affected. It depends upon some aberration of nutrition. It is distinctly constitutional, affecting the entire body, yet shows heredity, occurring, as it does, in families. Congestion develops easily, followed by the deposition of tophi, especially near the joints. The symptoms are described in detail, with a brief review of the etiology. It is noted both with arterial hypertension and hypotension. Bouloumié (*Jour. des Praticiens*, Aug. 23, 1902).

The researches of von Jaksch have shown that in various diseases the blood contains an abnormal quantity of uric acid, and different authors have proved this to be the constant result of an increased disintegration of leucocytes. A physiological leucocytosis has been observed in the first days of life, amounting to the double or triple, followed in the fifth day by a sudden fall of the number of leucocytes almost to the normal; this is accompanied by an excessive formation and excretion of uric acid, giving rise almost constantly to the excretion of

uric-acid sand and frequently to the formation of uric-acid infarctus in the kidneys (Gundobin, Fleusburg). Bartels, Laache, Ebstein, and various other investigators found an extraordinary increase of the daily excretion of uric acid in leukæmia; von Jaksch, Læhr, and Ewing observed a hyperproduction of uric acid and leucocytosis in pneumonia, and similar results have been found in the first stage of carcinomatous and all other diseases accompanied by leucocytosis. In all these maladies the hyperproduction of uric acid is distinguished only by the increase of the excretion of this compound, but the existing uricæmia is not conducive to gout or any of the symptoms of this complaint. The pathogenesis of gout is consequently not depending on uricæmia alone, and it is necessary to examine the special conditions under which uricæmia may produce gout.

Various theories have been proposed to explain this. The best supported of them shall now be shortly discussed.

According to Garrod, gout depends on a temporary or continuous decrease in the ability of the kidneys to excrete uric acid, by which an overcharging of the blood with uric acid is caused. Gout, in his opinion, is never caused by hyperproduction of uric acid, but by retention of it, although the progress of the disease is accelerated by temporary hyperproductions.

Garrod found a distinct diminution of the percentage of uric acid in the urine as well in chronic gout as in the acute cases, except during the attacks, when more uric acid than commonly was excreted; he, therefore, regarded the gouty attack as a salutary process which tends to deliver the system of its surplus of uric acid. It is to be regretted that the analytical methods used by Garrod

(Heintze's method and the thread method) are not reliable enough to give full evidence to the correctness of his statements.

Ebstein ("Natur u. Behandlung d. Greh") agrees with Garrod in the belief that in gout the blood is overcharged with uric acid, but he does not think that this arises from an affection of the kidneys. According to Ebstein, a primary gouty affection of the kidneys is a very rare occurrence; most frequently the kidneys remain for a long time healthy, and are only affected in the course of the disease in the same way as the articulations, etc. Ebstein's theory is that in gout uric acid is formed in excess in the body and that the hyperproduction also takes place in regions which ordinarily do not produce uric acid—as, for example, the bone-marrow, the cartilage, etc. When the blood and the lymph are overcharged with uric acid, it may act as a chemical poison, causing morbid processes in the tissues and giving rise even to necrobiotic changes; when these have reached a certain degree the biurate is deposited in the necrotic parts of the structures, whereas such deposition is never found elsewhere.

The theory of Ebstein must now be abandoned, as various authors,—such as Roberts, Cornil, and Riehl,—have found the crystals of biurate in comparatively healthy tissue, and have demonstrated that, after redissolution of the crystal needles, it was in many cases impossible to discover traces of necrobiosis in the structures in which the crystals had been imbedded. Moreover, experiments conducted by Ebstein and Nicolaier have demonstrated that it is impossible to inject large quantities of dissolved uric acid in the veins of animals or in their peritoneal cavity without causing serious damage; the kidneys, which are obliged to excrete such excessive quantities of uric acid, are alone irritated mechanically by the crystalline uric acid precipitated in them.

Pfeiffer (Berliner klin. Woch., '92; "Handbuch der specieler Therapie," B. 1) believes that the precipitation of

urates in gout and of uric acid in the kidneys in gravel are caused by a common uric-acid diathesis in which uric acid is produced in the body in a modified, almost insoluble form. In gout the uric acid is deposited as biurate without causing any morbid symptoms, but when from any cause—as, for example, by the ingestion of alkaline drugs—the alkalinity of the blood becomes so great that the blood redissolves the urates, they give rise to irritation and inflammation. The experiments of Pfeiffer, as well as his conclusions, have been contradicted by Roberts and many other observers. The urine of gouty patients is not always more liable to precipitation of uric acid than normal urine, and, as Freudberg states, the alkalinity of the blood varies but little and cannot be modified by the commonly used doses of alkalies or acids.

Von Noorden ("Pathologie des Stoffwechsels," Berlin, '93) has proposed a new theory without trying to prove it. In his opinion gout is an inflammation of nervous structures caused by an unknown irritant; by this inflammation a fermentation is set up, giving rise to a local formation of uric acid in the diseased tissues.

Another theory is proposed by Kolisch (Wiener med. Woch., '95). This author admits that the uric acid cannot be regarded as an irritating poison causing inflammation and necrobiosis, but he points to the fact that, when uric acid is formed by the disintegration of nuclein, it is always combined with a series of basic products,—the alloxur bases (xanthin, hypoxanthin, adenin, guanin),—which, by injection in the veins of animals, manifest violent toxic effects. In Kolisch's opinion, the alloxur bases are changed into uric acid by the healthy kidney and excreted as such; in the uric-acid diathesis the alloxur bases are formed in excess in the body, the kidney is overcharged and cannot convert them into uric acid; the alloxur bases are excreted in abnormal quantity and set up irritation of the kidneys as well as of the various structures of the body, and only when this inflammation has taken place the deposit of biurate occurs as

a secondary symptom. This ingenious theory has already been abandoned, many observers having found that the chemical method (Krüger-Wulff) by which Kolisch demonstrated the excessive excretion of alloxur bases in gout was not reliable, and that, moreover, the excreted quantity of alloxur bases varies so much as well in health as in disease that no conclusion can be drawn from their quantitative estimation. F. LEVISON.]

The phenomena of gout cannot be explained by a mere crystallization of urate from the blood or by the production of necrotic changes due to its presence in the circulation, seeing that in other conditions in which uric acid is present in excess in the blood—such as leucocythæmia and chronic nephritis—neither uratic deposits nor necrosis of cartilage are met with. Some unknown substances produce in gouty persons inflammation and necrotic changes in various tissues, and the necrosed tissues possess the power of attracting to themselves the excess of uric acid in the blood, while the chemical affinity of the necrosed parts for uric acid prevents the deposits from being redissolved by the blood. G. Klemperer (Deutsche med. Woch., xxi, p. 655, '95).

Although in the light of all the theories on the pathogenesis of gout discussed above and of the observations of innumerable investigators, many questions regarding the real nature of this complaint are still left unanswered, some facts are nevertheless settled beyond all doubt.

It is proved that in various diseases the blood contains an excess of uric acid and that gout is one of these diseases; secondly, it is certain that an excess of uric acid does not cause the deposit of biurate as long as the kidneys are healthy and their action normal.

In all described cases of gout, in which the post-mortem examination is mentioned, the kidneys have been found diseased, and in almost all cases they were

suffering from granular atrophy. Ebstein reported two clinical cases of gout in which the kidneys had been found healthy, but close investigation revealed the fact that the cases were so incompletely described as to be utterly valueless in that respect.

In all cases of granular atrophy of the kidneys, the power of elimination of the kidneys as regards uric acid, as well as various other substances, is diminished. Charcot found it defective under the administration of turpentine, which does not give the urine the characteristic odor of violets when the kidneys are granular atrophic. The consequence of this defective elimination of uric acid is its retention in the blood (von Jaksch), and various observers (Ord and Greenfield, Norman-Moore, Levison, Luff) have demonstrated that in granular atrophy of the kidneys deposits of biurate in the joints are very frequently found, even when no symptom of gout has been manifest during life.

Lead poisoning resembles gout in giving rise to an excess of uric acid in the blood, although it is not accompanied by leucocytes or increased disintegration of whole blood-corpuscles. Now it appears from experiments on animals (Charcot, Binet, Coen, and d'Ajutolo), as well as from observations of persons exposed to lead poisoning, that one of the earliest and most constant symptoms of this disease is a pathological change of the renal tubuli conducive in rather short time to granular atrophy of the kidneys. This accords very well with the fact that lead poisoning is very liable to give rise to gout, and that Garrod, Lancereaux, and various other observers have found that a large percentage of their gouty patients suffered also from the consequences of lead poisoning.

Case of typical gout under observation for several months. Uratic infiltration, which in cartilage invades as many cells as the basic substance, has not, in the kidney, any exclusive preference for intercanalicular tissues; it is as often intracanalicular. Intracanalicular concretions become covered with needle-like crystals which perforate the cellular passages; whence results the complex aspect of certain anatomical preparations. The time necessary for the quadriurate to convert itself into the biuric varies according to the quantity of quadriurate present in the blood, and the proportion of saline constituents of the blood. E. Brissaud and M. Brécy (*Presse Medicale*, July 22, 1903).

It has been proved by many experiments that continued irritation of the kidneys by chemical or mechanical irritants leads to inflammatory processes and formation of new connective tissue, resulting in granular atrophy. When the kidneys of patients suffering from gravel and calculi for some time are examined granular atrophy is always found.

When gouty persons are attacked by an intercurrent disease causing a temporary hyperproduction of uric acid,—as, for instance, pneumonia,—they are sure to get an attack of acute gout in connection with it.

When all these facts are combined and confronted they seem without exception to point to a theory of gout closely allied to the views proposed by Garrod.

Gout and its principal symptom—the deposition of biurates—occurs when the blood remains for some time overcharged with uric acid which cannot be eliminated by the kidneys on account of a decrease of their secretory power, which, in turn, is caused (with very few exceptions) by granular atrophy more or less distinctly developed. In all cases of gout the kidneys are diseased, and the gout can never develop as long as the kidneys remain healthy. The morbid

state of the kidneys may either be due to inherited predisposition (gout in children, early gout hereditary in families) or be acquired by chronic irritation (lead poisoning, abuse of alcoholic stimulants, uric-acid gravel and calculi). As long as the deposition of biurates progresses very slowly no symptom whatever is caused by it, and it is even possible that the deposits may be redissolved without having caused pain or injury at all; but when the deposits grow too large or when from any cause (excesses of every kind, intercurrent diseases, etc.) the production of uric acid gets very large, the deposits increase quickly, the lymphatics are obstructed, and a genuine attack of acute gout is produced. Injudicious therapeutics, such as the abuse of alkaline remedies or springs, are liable to produce attacks of gout by the ingestion of large quantities of sodium salts, which have a distinct deterrent influence on the solution of the quadriurates in the blood.

This theory does not explain all the various and anomalous symptoms of gout, and the question is left unanswered as to why all patients suffering from granular atrophy of the kidneys are not attacked by gout; but it has the advantage that it brings into one category all the etiological and pathogenic factors with which we are acquainted, and gives a plausible explanation of the origin of gout as well of the rich and overfed classes as of the poor and badly nourished. By this theory the close alliance of uric-acid gravel with gout becomes intelligible, and the enigmatic gout caused by lead impregnation has a rational explanation.

Pathology. — The most characteristic pathological change found in gout is the presence of deposits of biurate in various tissues. The order of invasion is fairly constant: the diarthrosial cartilages are

the first to be affected; then the ligaments, tendons, and bursæ; next the connective tissue and the skin become impregnated. Of the articulations the metatarso-phalangeal joint of the great toe is generally first affected, then the different metatarso- and metacarpo-phalangeal articulations, the tarsus and carpus, and next the larger joints; but their order is not constant. Almost all joints are attacked by gout,—perhaps with the exception of the hip-joint. The deposit first occurs in the superficial part of the cartilage close under its surface, in the form of fine, crystalline needles forming a more or less close net-work and presenting different degrees of opacity; sometimes it may be so small as to require the aid of a microscope for its detection. At first the central parts of the cartilages only are impregnated, whereas the peripheral tissues are free from deposits, but present some vascularization. Subsequently the fibrocartilages, ligaments, and synovial membranes become involved with white chalk-line deposits consisting of biurate; the synovial fluid may also contain crystal needles. The articulations become stiffened or fixed and ultimately they are greatly distorted and nodulated. The skin covering the affected joint becomes distended, and it may even be destroyed, exposing chalky masses, which break down and are successively evacuated, frequently giving rise to suppurative and ulcerative processes of the skin. It does not mean that the deposit is specially infiltrated in the cells, but rather that it pushes its way without special regard as to the component elements of the cartilage.

The periosteum and bursæ may also be implicated, and some authors have even believed that the bone itself may become affected. Virchow has described

isolated infiltrations of biurates in the spongy tissue of the phalanges, and in the marrow of the bones deposits may occur, mostly, but not always, in the neighborhood of incrustated cartilages.

Marchand and Lehmann have made chemical analysis of bone-tissue of gouty patients, and found that when the cartilages and the periosteum were removed the osseous tissue itself did not contain uric acid. Garrod observed that in gout of long standing the osseous tissue of the phalanges may become rarefied and the vacuoles filled with fat; by this process the bones are rendered more fragile than in the normal state.

Heberden observed a knotty or bosselated condition of the terminal phalangeal joints; this pathological state of the fingers has been known as Heberden's finger. In Heberden's opinion, the knots are not of gouty origin, but caused by arthritis deformans; a similar formation of the phalanges may, however, also be observed in gouty patients in very advanced life.

Deposits may be found in various other parts of the body, such as the external ear, eyelid, nose, and larynx; they form there nodules—tophi—which at first contain a liquid, but after some time get hard. Garrod evacuated from a single tophus of the hand 60 grammes (2 ounces) of biurate.

The muscles of gouty patients are ordinarily atrophic, especially when the extremities get stiffened and immovable.

The heart is frequently hypertrophic; myocarditis may occur, leading to the formation of fibroid or fatty degeneration of the muscles. The endocardium is sometimes in a state of chronic inflammation, and uratic deposits have been observed in it. In the aorta arteriosclerotic changes and uratic deposits have been noticed.

In the concretions in sclerosed aortic valves urates can sometimes be demonstrated by the murexide reaction, along with calcium phosphate and carbonate. More frequently gout causes valvular lesions indirectly as the result of sclerotic changes, but in this process other factors, such as abuse of alcohol or tobacco, lues, or overeating, assist. Gout is more prone to cause motor and sensory cardiac neuroses. Beginning with palpitation, soon followed by tachycardia, dilatation of the ventricles develops, with all its consequences. The sensory disturbances vary from mild, pricking pain in the region of the apex or more severe radiating pains to paroxysmal pain, with tenderness on pressure over the sternum or the base of the heart. The latter condition is often associated with symptoms of heart-weakness and can lead to angina pectoris. The prognosis in pure cases, not too far advanced, is good under proper treatment. Th. Schott (Berliner klin. Woch., Nos. 21 and 23, '96).

In the digestive tract congestion and a catarrhal state are found, as well as ulceration of the mucous membrane; but, as the ulcerations are observed only when the granular atrophy of the kidneys is fairly developed, they are probably caused by the renal disease and cannot be regarded as directly gouty.

The liver is commonly enlarged and in a state of fatty infiltration or of interstitial hepatitis; when this is the case, the spleen may also be enlarged.

The kidneys are always more or less pathological. In the large majority of cases they are granular,—atrophic: the kidney is contracted with a rough and granulated surface, small cysts are commonly seen on it, the capsule is adherent in different places, the color of the organ is red, the cortical substance warty and granular, and the walls of the arteries generally thickened; in short, the gouty kidney is identical with the small, granular kidney. In some cases deposits of biurate are found in the tubuli or between

them, appearing as whitish points or lines in the red structure of the organ. Uratic deposits may also be found in the pelvis and in the bladder.

In connection with the atheromatous changes which take place in the arterioles in gout is the gradual progress of the renal disease, the organ being affected in spots, with intermissions in the degenerative changes which are microscopical in size, until finally large areas are involved. In those cases the glomeruli and tubules are attacked in a way at times to cause scarcely an appreciable symptomatology, whereas the same change coming on suddenly, as in cases of a different etiology, cause striking clinical and urinary manifestations. The arterial changes in the nervous system lead to various nervous disturbances by interference with the nutrition of nerve-centres. Cerebral manifestation may arise from uræmia or from thrombosis of the cerebral arteries. N. S. Davis, Jr. (N. Y. Med. Record, July 10, '97).

A few observers have noticed the presence of urate deposits in the meninges of the brain and in the neurilemma of peripheral nerves.

Prognosis.—Acute gout is rarely immediately fatal; the attacks are very liable to return, but much depends on the mode of living adopted by the patients. Chronic gout decidedly shortens the life of the patients and often results in crippling them completely. The kidneys are always diseased in gout, and, when the granular atrophy of the kidneys develops to its utmost, there may be serious danger from the retention of the constituents of the urine, and gouty patients may die from uræmia.

Gout diminishes the power of resistance against acute disease and injuries; many gouty patients, nevertheless, reach an advanced age.

The prognosis of gouty heart is decidedly good. T. Mitchell Bruce (Practitioner, Jan., '95).

Treatment.—Prophylactic treatment of gout is of the greatest importance, not only to prevent the first attack in the case of hereditary disposition, but also after the first attack to prevent or at least delay recurrences. Gouty patients should avoid all aliments containing much nuclein, which, necessarily, tends to increase the percentage of uric acid in the blood; hence are contra-indicated all glands and internal organs composed chiefly of cells, such as brain, kidney, liver, and especially thymus gland; also meat-extracts contain much nuclein and are not to be allowed. Eggs do not contain nuclein, but paranuclein, which in the body is not decomposed into uric acid, and moderate quantities of eggs, therefore, can be eaten by the patients.

As the proteids do not change into uric acid, there is no reason to prohibit meat or fish in moderate quantity; about 200 grammes daily is quite sufficient, and a larger quantity will only tax the digestion and the secretory power of the kidneys.

In various cases of gout the prolonged administration of only red meat and hot water has resulted in marked improvement, which persists in spite of gradual return to an ordinary dietary. It is the complex chemical changes brought about by the admixture of red meats with carbohydrates and sugar that cause the excessive formation of uric acid. The patient is given daily allowance of from 1 to 4 pounds of lean beef-steak, minced and cooked in various ways, the patient drinking from 1 to 5 pints of hot water, and avoiding all starchy, saccharin, and fermentative articles of food. This treatment is indicated in obstinate chronic gouty arthritis, in recurrent uric-acid calculi, in frequent and intractable migraine, and in cases of persistent gouty dyspepsia.

This treatment should be prescribed but rarely, and then only under the most careful supervision in cases in which the heart or kidneys are discussed.

Used with due care, it is a most efficient and brilliant addition to the therapeutic measures. Armstrong (Brit. Med. Jour., May 1, '97).

Uric acid is not the *materies morbi* in uric-acid lesions. It acts pathologically only from its tendency to form concretions. Its formation, far from being a process of autointoxication, is a process of disintoxication. The decrease in the excretion of uric acid observed in some morbid conditions is not due to retention, but to non-formation. The *materia peccans* in uric-acid lesions are the alloxuric bases. In all so-called uric-acid lesions we find an absolute increase over the normal of the sum of uric acid and alloxuric bases.

The indications obtain—a reduction in nuclein-catabolism and a rising of the processes of oxygenation. Uric-acid cases should be treated as anæmic cases in all measures employed to promote the oxygenation powers of the blood. Iron is given usually combined with arsenic. Good results obtained in acute cases by inhalations of oxygen. On six occasions an attack of gout was cut short by giving inhalations of oxygen repeated at short intervals. Uric-acid headaches and attacks of migraine can invariably be relieved, if not cured, by the same treatment. A. C. Croftan (Jour. Amer. Med. Assoc., July 8, '99).

Out of 25 cases of gout in the knees, in 16 grating was obtained on movement. Best results obtained by the administration of colchicum, while salicylic acid did not appear to be so useful. Examination of the blood of gouty persons before, during, and after an attack never showed diminution in alkalinity, as compared with the blood of healthy human beings. A. Magnus-Levy (Zeit. f. klin. Med., B. 36, '99).

Conditions under which sodium salicylate fails, viz.: (1) if given in conditions of general debility or (2) in sequence to colchicum. Otherwise it is extremely useful in all uric-acid conditions. Haig (Lancet, Aug. 12, '99).

All sorts of farinaceous aliments, bread, milk, and vegetables of every kind are to be allowed.

For gouty patients a diet of fresh vegetables and fruits, with meat sparingly, and the exclusion of sugars and starches recommended. To remove the diathesis active physical exercise, alkaline baths followed by friction, and the use of lithium salts well diluted. Nothnagel (Inter. klin. Rund., Feb. 14, '92).

Administration of milk increases the excretion of xanthin bases and reduces that of uric acid. Increased quantity of liquid (water) in the diet increases the alloxin bodies (uric acid and xanthin bases) in healthy persons. Fatty milk, according to Gärtner's formula, is recommended as a suitable diet for all cases of gout. Laquer (Berliner klin. Woch., Sept. 7, '96).

There are three great manifestations of the same condition. These are rheumatoid arthritis; podagra, or true gout; and articular rheumatism. One must not attempt to treat gout, but treat the subject who comes before him. There is no diet for the gout, but there is a diet for the patient. Nevertheless, in the large majority of cases sugars and starches must be cut off. But in spare gouty subjects farinaceous diet may be essential. Milk probably suits the largest number of gouty patients. Patients who can take but little exercise at first can gradually be led up to the point of taking a great deal of exercise, and this is essential for prevention of further attacks. Strontium salicylate is less disturbing than salicylate of soda. In some instances it agrees better with the patient when combined with digitalis and strychnine. Medicines, however, will not eradicate the diathesis. H. C. Wood (N. Y. Med. Record, July 10, '97).

The analysis of the strawberry shows it to be particularly rich in sodium salts, and in spite of the high percentage of water this fruit excels all other common fruit in the amount of mineral salts. The chemistry of the strawberry therefore would teach that this fruit is likely to be beneficial in gouty states. (Lancet, June 24, '99, from Nature.)

Animal food generally is not only harmless, but beneficial to gouty persons, provided it be taken in moderation. The alleged difference between red

and white meats is nonsensical. Tender mutton, is, of course, more digestible than tough beef. There is no difference between red and white meats and fowl and any variety of game in regard to gout-provoking qualities, provided the quantity consumed is restricted and the cooking is plain and appropriate. Fish is one of the best articles of diet for the gouty. Lobsters, oysters, and most shell-fish are quite innocuous provided they are eaten fresh. Viscera, such as heart, liver, sweetbreads, etc., need be excluded from the diet.

As to vegetable food, ordinary bread, plain or toasted, or plain biscuits, are, of course, permissible. Potatoes, plainly cooked, are quite harmless. The assertion that roots and vegetables grown underground are harmful is rubbish, and fruit is condemned on very inadequate grounds. Most gouty persons can take fruit cooked or raw in moderation, not only with impunity, but with benefit. Tea, coffee, and cocoa are quite harmless. Sugar taken in moderation is not only harmless, but beneficial. Wines and alcoholic liquors require much discrimination. Many gouty persons are best without any, but the fact remains that many others are better for the use of a little good wine taken with one meal in the day. There can be no universal rule as to kind or amount. Most varieties of malt liquors are harmful to the majority of gouty patients, but in summer many persons can take small quantities of the lighter varieties, such as beer, with impunity and benefit. Well-prepared cider is an excellent drink in warm weather for gouty patients, but the quantity should not exceed a pint. Curtailing the food is generally harmful. Dyce Duckworth (*Practitioner*, July, 1903).

It is useful to prescribe rather large quantities of inoffensive beverages, such as pure water and milk, especially skim-milk or butter-milk, to favor the free action of the kidneys. The quantity of urine per twenty-four hours ought to be about 1500 to 2000 grammes (3 to 4 pints). Alkaline springs have been

much recommended, and when they do not contain too large quantities of soda they may be taken in moderate doses. Their use, however, should not be exaggerated, as the ingestion of much soda in the blood is liable to accelerate the deposition of biurate, and thus provoke an attack of gout.

The usefulness of Vichy water in gouty conditions probably depends on the sodium bicarbonate it contains. As long as one quart is taken a day a patient will remain free from migraine, but as soon as this is left off the attacks will return. W. J. Tyson (*Lancet*, Aug. 12, '99).

The light wines—such as Bordeaux, Mosel, and Rhine wine—may be allowed in small quantity; the stronger wines—such as sherry, port, champagne, etc., as well as ale and porter—are to be strictly prohibited. The pernicious effects of the stronger alcoholic drinks are proved by numerous observations, and are probably due to the power of alcohol to increase the formation of uric acid and to facilitate the deposition of urates.

Attention called to the fact that those accustomed to a saccharin diet have no special tendency to gouty arthritis, and that the urine of herbivorous animals, in whose diet sugar plays an important part, is alkaline in reaction. The relation of champagne to gout is difficult to determine, as the constituents of various preparations vary greatly. Of its constituents, sugar is, according to the author's view, the least and acetic acid the most harmful. G. Harley (*Lancet*, Aug. 1, '96).

Apart from individual peculiarities which are common in the gouty, the safest diet for these patients is the simplest diet. One must study individual dietetic capacities of the patients and adapt the diet to them.

A vegetarian diet may suit some, but it has not fallen to personal lot to meet such cases. The most troublesome

gouty headaches have been seen to disappear and a condition of greatly improved health result from an exclusive, or nearly exclusive diet of pounded meat with liberal draughts of hot water. The success of this treatment in such cases is plain. The pounded lean meat is about the simplest that can be offered to the feeble digestive organs, and physiologists state that "proteid food increases the quantity of bile secreted," and the large draughts of hot water flush the excretory ducts both of liver and kidneys. Extremely simple food, limited in amount, meaning as it does digestive ease, means also freedom from goutiness.

There is much also in the quality and cooking of food, often more than in the kind of food. The difference in the wholesomeness and digestibility of different specimens of bread is remarkable, and so it is with joints of meat, poultry, and fish.

This remark might be extended as to quality to wines also. A dry port, long in the wood, if it is freely diluted with hot water, is one of the best and safest wines for those gouty people who need some stimulant. Gouty women bear all wines badly. Many gouty patients can drink a small quantity of a well-matured, high-quality wine,—even champagne and port,—especially if diluted with water, who would be made ill by a single glass of common claret. The more diuretic the effect of the wines proves to be, the more suitable it is to the particular case.

There seems to exist a general impression that the gouty person is one who does not take an adequate amount of physical exercise and that he must be ordered to take more. That is not personal experience. The gouty patients seen have, in the majority of instances, been extremely active and energetic people, and it is often difficult to get them to take sufficient rest. This excess of muscular activity constantly leads them to take an excess of food, and then trouble arises because their excretory organs can hardly keep pace with the waste produced in the body; this is especially notable after middle

age. I. Burney Yeo (*Brit. Med. Jour.*, June 15, 1901).

Open-air exercise is very useful in the treatment of gout, and, when possible, gouty patients ought to spend their holidays in regular active exercise, such as walking, cycling, riding, etc.

TREATMENT OF THE ACUTE ATTACK.
—Abortive treatment of an acute attack of gout has repeatedly been tried, but it is not to be recommended, being attended with great risk. The method proposed has been strapping the affected joint with adhesive plaster; the application of snow or ice; the hypodermic injection of morphine; large doses of colchicum, etc. Undoubtedly the attack may be stopped short by these methods, but very dangerous symptoms, such as fainting, disorder of the action of the heart, etc., have been observed as the immediate result of these procedures.

Although medicine has now abandoned the old maxim that during the attack the affected joint was only to be treated "with flannel and patience," the treatment of the attack ought not to be too active. The patient should remain in a recumbent position, though not necessarily in bed, for some days; the affected limb should be raised and supported, kept warm, and protected from pressure. The pain is relieved by warm alcoholic lotions, application of opium ointments or liniments; menthol in an alcoholic solution. Ointments of ichthyol are also to be recommended.

In mild attacks of acute gout, absolute rest, diluent drinks, and the application to the affected joints of an ointment composed of sodium salicylate, 1 1/4 drachms, and lanolin, 1 1/2 ounces, recommended. W. Morain (*Bull. Général de Thérap.*, July 30, '95).

Most of the remedies are useful, mainly through the suggestion of relief they afford to sufferers. Blood-letting

and blisters were formerly in use, but are now generally abandoned.

English practitioners often begin the treatment of an attack of gout by the administration of a free purgative: calomel and jalap or *mistura sennæ composita*.

Of remedies directed toward the gouty process itself colchicum is the most effective; its mode of action is obscure, but it seems to relieve the pain better than any drug; colchicum is ordinarily prescribed as wine of colchicum and may well be combined with tincture of aconite; 25 minims of wine of colchicum with 3 to 5 minims of tincture of aconite may be given three or four times daily. The use of colchicum ought only to be continued from four to six days, as it is liable to produce nausea and diarrhoea, and even paralysis of the nervous centres when taken too long a time. A very active principle of colchicum—the colchicine—has also been employed. As soon as the anodyne effect of colchicum has been reached the use of the drug is to be discontinued. Under any circumstances, however, it should no longer be given when nausea or diarrhoea sets in.

Colchicum is *par excellence* the specific for gout. Lecorché (*La Méd. Mod.*, July 14, '94).

To check the excessive formation of uric acid, liver-metabolism should be promoted, and congestion of the portal system relieved by regulating the diet and regimen. Colchicum and guaiacum, as stimulants of hepatic metabolism, are very useful in many forms of gout. Constipation and the congestion of the portal system may be relieved by occasional doses of blue pill followed by an Epsom-salt purge.

To promote the elimination of the quadriurates formed in the kidneys and so prevent their absorption into the blood is to strike at the primary evil in the causation of gout. To promote this, diuresis should be increased and the acid-

ity of the urine diminished. Citrate of potassium is a good diuretic which not only increases the solubility of the quadriurates, but also diminishes the acidity of the urine, and should be pushed until moderate alkalinity of the urine is produced. Luff (*Indian Medical Record*, July 1, '98).

The writer discusses three types: (1) The acute attack of gout; (2) subacute gout; (3) chronic gout. Colchicum and its active principles is the chief drug. Granules of colchicine, 0.001 gramme—four granules at the onset, or during twenty-four hours. The tincture of the seed or root is effective, but variable in strength. To obtain results, 40 to 60 drops a day in doses of 10 to 15 drops at a time is necessary, if a visceral manifestation preceded the articular attack or venal symptoms. The action of colchicum can be aided by local applications, and hot air or steam. Sodium salicylate is useful in subacute gout. In chronic gout, hygiene, regulation of life and drugs are all equally important. In diet, red meats should be excluded. But two-thirds of the diet should be made up from white meats. Of drugs, strychnine and arsenic are valuable. Robin (*Bull. gen. d. therap.*, No. 16, 1904).

Although the salicylates are certainly inferior to the colchicum, it is advisable to try them when colchicum is not well borne or when it fails to alleviate the pain. Generally the salicylate of sodium is used; the salicylate of lithium has also been recommended.

The clearing of the system of uric acid by alkalies or salicylates leaves the principal part of the work undone, which is the use of suitable remedies to correct the faulty metabolism in whatever system the disease first arose. M. A. Boyd (*Lancet*, Aug. 8, '96).

When the pain has subsided and the swelling of the joint is somewhat diminished, gentle use of the joint and careful (but not energetic) massage are useful.

In the interval between the attacks the tendency to renewed attacks by the prolonged use of alkalines is of impor-

tance. Of these the carbonates and the phosphates of sodium and potassium and the carbonate of lithium have been most employed, but their use is now known to be based upon fallacious deductions.

[The administration of alkalines is based upon the theory that gout is caused by a lessened alkalinity of the blood. The alkaline remedies, by augmenting the alkalinity, would increase the power of the blood to dissolve uric acid and thus prevent the deposit of biurate.

The experiments of Roberts have quite destroyed this fundamental hypothesis by proving that in gout there exists no abnormal acidity of the blood and that addition of carbonates or phosphates of alkalines to blood-serum impregnated with uric acid does not retard the precipitation of biurate; the alkalines are consequently without power to prevent the formation of uratic deposits, and salts of soda may even prove directly pernicious when taken in large doses.

Carbonate of lithia was introduced in the therapeutics of gout by Garrod expressly on account of its chemical action. A solution of carbonate of lithia has great solvent power on uric acid, and from this fact it was inferred that lithia administered internally might communicate its power to the urine and the blood, and that in this way as well the formation of uric-acid gravel as the deposition of biurates in gout might be prevented.

Neither of these inferences is justified. Mendelsohn (Berliner klin. Woch., '93) has shown by numerous experiments that the urine of persons to whom carbonate of lithia had been freely administered did not dissolve more uric acid than normal urine, and he observed, moreover, that the addition of normal urine to a solution of uric acid, effected by the aid of carbonate of lithia, was sufficient to precipitate almost all the uric acid contained in it. When carbonate of lithia has some value in the treatment of gravel it is only on account of its action as a powerful diuretic. Roberts demonstrated that the addition of carbonate of lithia to blood-serum or

to synovia has not the slightest effect to enhance the solvent power of these media on sodium biurate or in retarding its precipitation from serum or synovia impregnated with uric acid. F. LEVISON.]

Various basic organic products—piperazin, lycetol, lysidin—have recently been recommended as specifics for uric-acid gravel and gout on account of their power to dissolve uric acid. Mendelsohn has tried the effects of all these compounds, and found that urine saturated with them does not dissolve uric acid any more than normal urine, and they are, of course, still more ineffective when circulating in feeble concentration with the blood.

In an old gouty case, by daily injection of 5 minims of hydrochlorate of piperazin, the uric-acid deposit in the urine was very materially lowered. Bardet (Münch. med. Woch., June 16, '91).

Piperazin highly recommended in the treatment of both acute and chronic gout. It may be given to the extent of 15 grains per day, largely diluted with water. Schweininger (Jour. of the Amer. Med. Assoc., Sept. 24, '92).

Lysidin has proved to be a powerful remedy for gout, the pain ceasing soon after its use is begun, the joints becoming supple and the tophi diminishing. E. Grawitz (Deutsche med. Woch., No. 41, '94).

In acute gout piperazin causes a rapid amelioration of the pain and a progressive diminution of the swelling and redness. In chronic gout it appears to have an elective action upon tophi and upon the articular stiffness. The author has seen voluminous tophi disappear and deformed limbs assume an almost normal aspect, due to the persistent usage of the remedy, which is possible by its harmless action upon the organism. Delmis (Gaz. des Hôp., Mar. 5, '96).

Gouty tophi removed by injections of piperazin, each consisting of 8 minims of distilled water and $\frac{1}{10}$ grain of piperazin. A little burning followed the first injection, but this was allayed by the application of ice, and in subsequent operations all pain was avoided by having

the part first sprayed with ether. The complete absorption of the tophus was effected by the treatment. Gioffredi (*Gaz. degli Ospedali*, Aug. 20, '99).

Sidonal, a combination of chinic acid and piperazin, is very effective in dissolving an excess of uric acid. In doses of 15 grains every two hours no unpleasant results ensued. Salfeld (*Münchener med. Woch.*, Apr. 2, 1901).

Sidonal is a preparation made by the combination of chinic acid and piperazin. Weiss discovered that this substance was capable of diminishing the formation of uric acid in the body, and Blumenthal showed that this reduction in the excretion of uric acid was real, and not merely due to its retention in the system. When 75 to 120 grains are given in twenty-four hours, the excretion of uric acid sinks 30 to 50 per cent. Von Leyden, Ewald, and Goldscheider report favorable results with their use of sidonal in gout, and Mylius has confirmed their statements. The latter found it worked advantageously in cases which resisted all other modes of treatment. It alleviated the pains, rendered motion less difficult, and shortened the duration of the attack. Improvement began after about four days instead of in three to four weeks. Seventy-five to 120 grains of sidonal were given daily at first, but later it was prescribed in much smaller doses. It was satisfactory not alone in the acute, but in the chronic cases as well. In other instances Mylius felt convinced that when he gave 75 grains at the very beginning of an attack he aborted its course, so that it was, in a sense, prophylactic.

The appetite appears to be affected only favorably, and Mylius noted no unpleasant or dangerous consequences from the use of the drug. E. P. Joslin (*Boston Med. and Surg. Jour.*, July 11, 1901).

Quinic acid recommended in gout. It tends to check the formation of uric acid, as shown experimentally by Weiss. The same obtained from fruit does not depend on the alkalies contained in them, but to the presence in them of quinic acid. This agent is changed in the organism into benzoic acid, which,

in its turn, is converted into hippuric acid. This acid is thought to be much more soluble in water than uric acid. Hugo Sternfeld (*Münchener med. Woch.*, xlviii, No. 7, 1901).

Uricedin, a new remedy proposed by Mendelsohn, is a combination of citrate of sodium, sulphate of sodium, and small quantities of common salt and citrate of lithium. It may be of use in the treatment of uric-acid gravel, but in gout it is about on a level with the other compounds of soda.

MINERAL SPRINGS. — A considerable number of springs to which gouty patients commonly resort are strongly impregnated with the salts of soda; it is not, therefore, surprising that not infrequently the first result of the cure is to provoke an acute attack of gout or to aggravate the symptoms with which the patient was suffering. The physicians practicing at these resorts are accustomed to consider this aggravation as of good augury. Perhaps they are right, as it does happen that a patient, who for some time has been laboring under the preliminary symptoms of gout, feels better when the attack has passed over and a large quantity of uric acid has been removed from the blood; but it is a rough mode of cure, and many physicians, especially the English, now advise the patients to avoid strong alkaline springs or to take them very sparingly. Roberts resumes his opinion of the strong alkaline springs (Vichy, Carlsbad, etc.) in the treatment of gout in the following words: "It is difficult to believe that they can do any direct good, and easy to believe that they can do direct harm."

In cases of gout in which the urine constantly precipitates crystals of uric acid, it is advisable to prescribe some alkaline remedy or alkaline spring-water, to prevent the precipitation and the irri-

tation of the kidneys caused by it; the doses should, however, be regulated by the degree of acidity of the urine, and not more of the alkaline drug is to be taken than necessary to reduce the acidity of the urine to the normal level and thus render it limpid and without deposit of crystals.

Some springs are devoid of the dangers dependent on the use of the strong alkaline waters, as they do not contain the salts of soda or only very small quantities of them; they are either aerated, contain but little besides the pure, warm water, or they contain some carbonate of lime or sulphate of lime; in many cases the free use of these springs, combined with douches, moor-baths, massage, and hydrotherapeutics in its different applications will be useful, especially against the stiffness of the joints remaining after acute attacks.

Hydrotherapy recommended in the treatment of gout, but not during the attack. Rubino (*Blatter f. klin. Hydrotherapie und verwandte Heilmethoden*, June, '93).

Among the most renowned springs of this kind may be mentioned Buxton and Bath, in England; Aix-les-bains and Contrexéville, in France; Wildbad, Gastein, and Pfeffers, in Germany and Switzerland; and Sandifjord, in Norway.

Of the drugs which have been recommended against gout, guaiac merits special mention. It was introduced by Garrod, and is administered in a dose of 7 to 10 grains of the resin daily, ordinarily combined with iodide of potassium or quinine. It seems to have a very good effect in many cases, as it is well supported by the patients, even under protracted use. It seems to retard the return of the gouty attacks.

Guaiac does not effect the formation of uric acid, but acts directly upon the kidneys as a stimulant, enabling it to

get rid of any accumulation in the tubules, thus preventing absorption from them into the blood. Garrod (*Med. Record*, July 4, '96).

Edison, and after him Labatut, Lev-ison, Chauvet, and Gilles, have advocated the electric treatment against the stiffness of gouty joints; by this treatment remedies are introduced through the skin by the aid of a galvanic current. The experiments of Labatut and other scientists have demonstrated that the alkaline substances enter in the body with the positive current, whereas the acids are introduced with the negative. The remedy employed in this way against the gouty affections is lithia, which is liberated by the decomposition of the salts of lithia by the electrolytic effect of the current and enters through the skin in the nascent state, and consequently in a very effective condition. Labatut conducts the dielectric treatment in the following way: A 2-per-cent. solution of chloride of lithia is rendered alkaline by addition of some caustic lithia or carbonate of lithia, and the hand or foot which is to be treated is placed in a saucer filled with the solution, into which also the positive conductor is plunged, taking care that the conductor does not touch the skin; the negative conductor (both conductors are made of charcoal) is placed in another saucer filled with a feeble solution of common salt, and some part of the body, hand or foot, is put in contact with this liquid. A current of 15, 20, or 25 milliampères is used, according to circumstances, and each *séance* is of 30 minutes' duration. By the continued use of this method, I have in many instances succeeded in restoring to gouty joints the mobility which had been lost for several years. While it is also possible to dissolve tophi, some part of the swelling caused by the deposits will, however, always remain, as the

tophi do not consist only of biurate of soda, but contain also new-formed connective tissue, which cannot be dissolved by the lithia.

Another new and valuable addition to the therapeutics of gout is the hot-air bath. In all the different forms of baths, mineral bath, moor-baths, Turkish, and Russian baths, which have been employed for a long time with varying success against gout, the heat is the common active principle. It is difficult to bear more than 50 or at most 60 degrees of Celsius when the heat is applied as vapor-bath, moist air, or hot water; but when the heat is administered by means of dry air, a far higher temperature is borne without pain or damage.

Tallermann, of Sheffield, and Betz, of Chicago, have invented ingenious apparatuses, by which an arm or foot may be exposed for from 30 to 50 minutes to a current of dry air heated to 100-150° C. and even more, and many observers (Knowsley, Sargent, Mendelsohn, Levison) have noticed the good effects of this treatment against the stiffness of gouty articulations, especially when it is combined with the use of massage.

Attention called to an apparatus which has been employed in a series of cases in the University Hospital, where some 300 baths were given to test its efficiency. It was found to be most satisfactory. The required temperature can be obtained quickly, in from 10 to 15 minutes, and the apparatus is substantially but simply constructed, and involves nothing that can get out of order or require repair. The cases that were treated included acute and chronic articular rheumatism, gonorrhœal rheumatism, gout, traumatic arthritis, synovitis, tenosynovitis, and fibrous ankylosis.

The method of administering the bath is as follows: The patient's pulse and temperature were first taken and recorded. The limb, first being completely enveloped with a piece of lint, which was

wrapped loosely about the part, was then placed in the cylinder. The time allowed for each bath was from three-fourths of an hour to an hour. At intervals of 20 minutes the door of the cylinder was thrown open momentarily to allow of the ingress of a fresh supply of air. If the patient perspired freely, this opportunity was taken advantage of to wipe the limb thoroughly dry. If this precaution is not taken and the limb is allowed to remain bathed with sweat, there is the possibility, if the temperature is exceedingly high, of a superficial burn resulting. This happened in several cases where the precaution was not taken. The degree of temperature employed varied, some patients bearing with perfect comfort a degree of heat which would be extremely painful to others. The average was about 300° F., although in one case the temperature reached 375° F., to which the patient seemed quite indifferent. The frequency with which the baths were given varied with the severity of the case; usually, however, they were administered on every other day.

Certain physiological phenomena followed the application of heat, such as increased arterial tension, elevation of the blood-pressure, dilatation of the lumen of the blood-vessels, diminution of the erythrocytes, decrease of hæmoglobin, increase in the elimination of nitrogen, and increase in frequency of the heart's action. In cases in which there is a diathesis, either rheumatic or tuberculous, this treatment can have no beneficial constitutional effect.

Permanent cures of local lesions, symptomatic of diathetic diseases, are not to be looked for from the employment of hot-air baths, but for the relief of joint affections of traumatic origin this method of treatment is most useful and sometimes indispensable, and the results obtained can be called permanent. C. H. Frazier (Annals of Surg., Oct., '97).

A year's experience with the Sprague hot-air therapeutic apparatus has demonstrated that it has not often been disappointing in its action in the usual types of gout or rheumatism. Even where tophi have formed, the solidifica-

tions are frequently softened and carried off through the excretory organs.

The skin and kidneys are stimulated by the hot blood, and circulation is restored to the affected part.

All cases, as far as heard from, have kept what they gained, excepting in so far as they have returned to errors of diet and lack of exercise. As a matter of course, the originating causes may induce a return of the trouble.

The failure of an apparatus to run to a very high temperature must certainly curtail its usefulness. This mode of treatment becomes a most useful adjunct to medical and surgical treatment. A. Graham Reed (Phila. Polyclinic, Aug. 6, '98).

To sum up, the principles of the treatment of gout are these: In all cases the diet is to be regulated with a view to sustain the forces of the patient without allowing any excess of food; the patient is to be advised to limit the use of alcoholic stimulants and to avoid equally excess of work and of enjoyments, whereas bodily exercise and open-air life are useful. The patient ought to drink pure water of some aerated spring in sufficient quantity to keep the daily excretion of urine from 3 to 4 pints; if the urine be strongly acid and liable to precipitation of uric-acid crystals, the administration of small doses of some alkaline drug or spring should be resorted to to diminish the acidity and render the urine limpid.

The influence of some modern drugs on metabolism in gout: There is an increase of albumin coincident with the development of a subacute attack of gout. There is a preponderance of serum globulin over serum albumin. The peculiar leucocytes described by Chalmers Watson are present in the blood. Lithium benzoate and urotropin are ineffective in relation to uric acid excretion. Piperidin tartrate, piperidin, lysidin and sidonal, in the order named, show an increasingly augmenting effect on uric acid excretion. The excretion

of uric acid is diminished during the administration of colchic-sal and the conjugated sulphates are increased. The solvent action of tetra-ethyl ammonium hydrate or sodium biurate probably depends upon its alkalinity. Bain (Brit. Med. Jour., Jan. 31, 1903).

The gouty attacks are treated by rest, somewhat reduced *régime*, anodynes, if necessary, and colchicum; in the free intervals the resin of guaiac will be of use. The stiffness of the gouty joints and the tophi are treated by the dielectric introduction of lithia, by the hot-air bath, and by massage.

A visit to some spring where the application of hot baths, douches, and massage are combined with the use of some aerated spring and good vivifying air will be of use to restore the forces and the spirits of the patient. Also a sojourn in some dry and hot climate is advisable as well for the specific gouty symptoms as for the disease of the kidneys, which is the constant companion of gout.

The obscure symptoms of the so-called visceral gout require very different treatment after their nature, but in all cases it must be remembered that gout is only to be treated successfully when great care is given to the dietetic and hygienic treatment of the whole system. This cannot be regulated by one common rule, but it must be carefully adapted not only to each patient, but to the different stages and periods of the malady.

F. LEVISON,

Copenhagen.

GRAND MAL. See EPILEPSY.

GRANULAR LIDS. See BLEPHARITIS.

GRAVES'S DISEASE. See EXOPHTHALMIC GOITRE.

GRINDELIA.—Grindelia is the leaves and flowering tops of *Grindelia robusta*

and *Grindelia squarrosa*, which are herbaceous perennial plants indigenous to Mexico and the Pacific coast of the United States. They contain a resin, a volatile oil, and an alkaloid (grindeline).

Preparations and Doses.—*Grindelia* (leaves and tops), $\frac{1}{4}$ to 1 drachm.

Extract of *grindelia*, fluid, $\frac{1}{2}$ to 1 drachm.

Physiological Action.—*Grindelia* has an acrid, bitter taste. When chewed it excites the secretion of saliva. It is an antispasmodic, motor depressant, and has light expectorant and diuretic action. It slows the heart and increases the blood-pressure. It stimulates the bronchial membrane and the kidneys, and is eliminated by them. When given in large doses, it induces paralysis of the peripheral sensory nerves, the sensory centres in the spinal cord, and later the motor centres and nerve-trunks; the pupils become dilated and renal irritation is produced.

In warm-blooded animals the phenomena which *grindelia robusta* produces may be ascribed to an exciting action upon the bulbar centre of the pneumogastric, which, when a large dose is introduced at one time into the circulation, appears to be paralyzant. The effects upon blood-pressure are that with small doses there is a slight rise, which is more evident with medium doses; but as the amount is increased the pressure gradually and continually falls during the same time that the oscillations are shorter. When its effects on the pneumogastric are considered and also its power of contracting bronchial muscles and its action on the heart, it is likely, in proper doses, to be of value as a remedy for the symptom of asthma. The drug contains an active principle, likely terpene, which benefits the associated catarrh. The drug apparently possesses a paralyzing action on the thermogenic centre. The secretions are changed as follows: The urine is increased by small and diminished by large

dose-, partly from changes in blood-pressure and partly from direct action on the renal epithelium. The saliva and bile are increased. Both urine and saliva are of greenish tinge. Luigi d'Amore (*Giornale della Associazione Napoletana di Medici e Naturalista*, Puntata 5a e 6a, p. 331, '96).

Therapeutics.—Spasmodic asthma and bronchitic dyspnoea may be relieved by the fluid extract of *grindelia* in doses of $\frac{1}{4}$ to 1 fluidrachm, every three or four hours, given preferably in a little sweetened water or milk. In recurrent asthma it often affords prompt relief, but it does not prevent the return of the paroxysms. It is also beneficial in spasmodic coughs, pertussis, chronic bronchitis, and in hay fever. The leaves of *grindelia* soaked in a solution of nitrate of potash and dried may be burned or smoked, and the fumes inhaled.

In emphysema *grindelia robusta* facilitates the respiration and expectoration. In simple cardiac hypertrophy and in dilatation it has all the advantages of digitalis without any of its drawbacks. It relieves pulmonary congestion and the palpitation associated with cardiac hypertrophy, emphysema, asthma, and incipient tuberculosis. The following formula is useful:—

R Tincture of *grindelia*, 6 parts.
Tincture of convallaria, 2 parts.
Tincture of squill, 1 part.

Fifteen drops three times a day.
Huchard (*Jour. de Méd. de Paris*, No. 16, '98).

In chronic cystitis it gives relief by stimulating the mucous membrane of the bladder. The fluid extract diluted with water (1 to 10) is a very valuable lotion in poison-oak or poison-ivy eruption, and in pruritic skin affections.

C. SUMNER WITHERSTINE,
Philadelphia.

GRIPPE, LA. See INFLUENZA.

GUAIAIC.—Guaiac-wood (guaiaci lignum, U. S. P.) is the heart-wood of *Guaiacum officinale* (*Lignum vitæ*). It is employed as scrapings or chips, of olive, brown, or yellow color, very hard, and having a faint, aromatic odor and a pungent acrid taste. It enters into the composition of the compound syrup of sarsaparilla. The wood furnishes a resin (resina guaiaci, U. S. P.) which is brittle and breaks with a bright, lustrous fracture. Its odor and taste are the same as that of the wood. Its powder is grayish, but becomes green on exposure to the air. It is soluble in alcohol, ether, and alkaline solutions, but very slightly so in water. Guaiac resin is an ingredient of Plummer's pills (pilulæ antimonii compositæ, U. S. P.).

Preparations and Doses.—Resin of guaiac, 10 to 30 grains.

Tincture of guaiac, $\frac{1}{2}$ to 1 drachm.

Tincture of guaiac, ammoniated, $\frac{1}{2}$ to 1 drachm.

Physiological Action.—Guaiac taken internally causes a sense of warmth in the stomach, and increases the secretion of the digestive fluids. In large doses it gives rise to gastro-intestinal irritation and produces active purgation. A well-marked rash, attended with great itching and resembling that of copaiba, sometimes follows the use of guaiac.

Best use of guaiac is as a laxative or purgative. In one case in which this drug was prescribed a well-marked rash, resembling that of copaiba, covered the arms and legs of the patient. It was accompanied by intense itching, and disappeared upon the withdrawal of the drug. William Murrell (*Medical Bulletin*, Jan., '91).

Guaiac possesses none of the properties which are essential to its use as a laxative; the dose required to produce the desired effect is too large to be safe or agreeable, and the action of the drug in this direction altogether too uncertain.

Combemale (*Rev. Inter. de Méd. et de Chir.*, Feb. 25, '96).

The reaction of leucocytes to guaiac depends on the oxidizing effect of nucleoproteids in the pus-cells; possibly due to a fermentation which could not be separated from the other substances. The nucleoproteids of the liver, spleen, and thymus are all capable of breaking down hydrogen peroxide, but do not turn guaiac tincture blue. Only one tissue of all those examined was able to produce the same reaction with guaiac as pus, namely: bone-marrow, leukæmic blood, even in the smallest quantities, in marked cases turns guaiac tincture blue. Brandenburg (*Münchener med. Woch.*, Feb. 6, 1900).

Therapeutics.—Guaiac given early in a 30-grain dose, either in powder or in emulsion with the white of egg, will often abort an attack of acute tonsillitis or of acute pharyngitis. Rheumatism of subacute or chronic type, gout, and rheumatic pharyngitis may be relieved by the administration of either the tincture or the ammoniated tincture of guaiac; but, on account of its disagreeable character, other remedies are preferred.

Guaiac is valuable in many gouty and rheumatic conditions. It possesses the following advantages: 1. It is innocuous, and may be taken for an indefinite length of time. 2. It possesses considerable power, but less than colchicum, in directly relieving patients suffering from gouty inflammation of any part; it may be given whenever there is but little fever. 3. Taken in the intervals of gouty attacks, it has a considerable power of averting their occurrence; in fact, it is a very powerful prophylactic. 4. It does not seem to lose its prophylactic power by long-continued use. 5. There are a few patients who cannot continue its use. Guaiacum does not affect the formation of uric acid, but acts directly on the kidneys as a stimulant, enabling them to get rid of any accumulation in the tubules, thus preventing absorption from them into the blood. Sir Alfred Garrod (*Med. Record*, July 4, '96).

AMENORRHOEA.—In amenorrhœa not associated with anæmia, the administration of 10 grains of guaiac, stirred in milk, before breakfast, will give good results if continued for some weeks. Painful menstruation may be relieved by the ammoniated tincture in doses of $\frac{1}{2}$ to 1 drachm every two or three hours.

C. SUMNER WITHERSTINE,

Philadelphia.

GUAIACOL.—Guaiacol (monomethylcatechol, methyl-ether of pyrocatechin; methylpyrocatechin) is a highly-refractive, colorless, oily liquid, having a characteristic aromatic, agreeable odor, and is obtained by fractional distillation from beech-wood creasote. It may also be obtained by the dry distillation of guaiacum, or produced synthetically by the action of methyl-sulphuric acid upon pyrocatechin. It is freely soluble in alcohol, ether, and carbon disulphide, and in 85 (Helbing) or 200 (Merck) parts of water. It also occurs in colorless crystals, which are freely soluble in glycerin, alcohol, ether, and slightly soluble in water. It forms salts with the acids; the carbonate and salicylate is a white, insipid crystalline substance, with the odor of salol, and soluble in alcohol.

Iodoguaiacol is best prepared by adding 62 grains of iodine to 8 $\frac{1}{4}$ drachms of guaiacol and applying a gentle heat. After the iodine is dissolved, 50 ounces of pure olive-oil are added. W. H. Gregg (N. Y. Med. Jour., Nov. 21, '91).

Attention called to a new pulmonary antiseptic, which is obtained from guaiacol by the action of caustic soda; the sodated guaiacol thus formed being afterward precipitated by a watery solution of sodated iodine, a guaiacol biiodide is obtained. The new drug occurs as a brownish-red powder, soluble in alcohol and in the oils. Vicario (Revue Inter. de Bibliographie, Mar. 25, '92).

Although guaiacol has hitherto been described as a liquid, the pure synthetic

product is a solid body, crystallizing in colorless prisms, which melt at 83.3° F., boiling taking place at 369° F. It is readily dissolved in pure, undiluted glycerin, the solubility in water being only 1 to 50. Liebreich (Ther. Monats., May, '93).

Crystals of pure guaiacol are white and hard. When melted, the guaiacol remains in fusion for an indefinite time. It is soluble in most of the organic solvents, even in benzine; it is also soluble in petroleum-ether, and crystallizes very well on the evaporation of this solvent. Anhydrous glycerin dissolves crystalline guaiacol in large proportions. Gilbert and Morat (L'Union Méd., p. 753, '93).

Absolutely-pure, crystalline guaiacol has little taste or smell. It can be obtained in an absolutely-pure condition from a commercial sample by cooling with a mixture of ice and salt, and then separating the crystals which have formed. S. Winghoffer (Pharm. Zeit., No. 34, '94).

Preparations and Doses.—Guaiacol (liquid), 2 minims, gradually increased to 16 minims.

Guaiacol (solid), 12 grains, gradually increased to 15 grains.

Guaiacol-carbonate, 3 to 8 grains, increased to 90 grains.

Guaiacol-cinnate (styracal), 5 grains.

Guaiacol-salicylate (guaiacol-salol), 15 grains; maximum daily dose, 150 grains.

Guaiacol-benzoate (benzoyl-guaiacol; benzosol), 3 to 12 grains.

Guaiacol-biniodide, 2 grains, increased to 15 grains.

New preparation of guaiacol: guaiamar, a reaction product of guaiacol and anhydrous glycerin. In typhoid fever the general symptoms were less severe than in those cases in which it was not given, systematic cold bathing being employed in both series. An ointment of guaiamar with lanolin lessens the joint suffering of rheumatism. It possesses marked stomachic properties, stimulating the appetite and digestion. Butler (N. Y. Med. Jour., Sept. 23, '99).

New guaiacol preparation: the diethylglycocol-guaiacol. This is an easily soluble salt which lacks the undesirable properties of creasote and its derivatives. This salt is non-poisonous and non-irritating in moderate concentration. In its antiseptic powers it equals boric acid and is also slightly anæsthetic. Forty-five to 180 grains daily may be safely taken. It is of value in pulmonary tuberculosis and in tuberculous diarrhœas, and locally in ozæna; sarcomatous, carcinomatous, and syphilitic ulcers; stomatitis; chronic conjunctivitis; empyema alveolaris; and as irrigations in pyloric stenosis and bladder inflammation. A. Einhorn (*Münchener med. Woch.*, Jan. 2, 1900).

New preparation of guaiacol: the guaiacol cacodylate. It is the result of the combination of cacodylic acid with guaiacol. Employed hypodermically in doses of $\frac{1}{2}$ to $\frac{3}{4}$ grain in tuberculosis. Barbary (*Bull. Commer.*, xxviii, p. 35, 1900).

Physiological Action.—The physiological action of guaiacol is similar to that of its congener, creasote, although its effects on the gastro-intestinal tract are not so irritating. The respiration and pulse are only temporarily affected. The blood-pressure is slightly increased, and there is slight contraction of the arterioles. Large doses produce a burning sensation in the stomach, nausea, etc.: symptoms of gastro-intestinal irritation. Guaiacol is excreted principally by the kidneys, as guaiaco-sulphuric ether, but also by the skin and the salivary glands, and in small measure by the lungs.

The effect produced by guaiacol is not due to its action on the digestive organs. In combination with the blood guaiacol has no such action. The medicament is eliminated as a salt of ethyl-sulphuric acid, and thus, when absorbed into the blood, it must have combined with albuminous bodies, and chiefly through the sulphur present in the albumin molecule. In the blood of phthisical patients there are, in addition, other albuminous bodies, namely: the products

of the growth of the bacilli. The absorbed guaiacol combines with these products and renders them harmless, and they are further changed by oxidation, the guaiacol being liberated as a salt of ethyl-sulphuric acid, and the other decomposition products being eliminated in the urine. Hollscher and Seifert (*Berliner klin. Woch.*, Jan. 18, '92).

Guaiacol administered by the alimentary tract is only partly absorbed. It is more readily absorbed in healthy than in sick persons. For its absorption it is sufficient to give it in daily doses of $7\frac{3}{4}$ grains. Administered in such doses, it does not cause nausea, and is well borne by patients. Guaiacol is not eliminated as such by the urine, but in the form of a body giving the reaction of phenol. Poggi (*Riforma Medica*, Aug. 10, '92).

Guaiacol acts by influencing the peripheral ends of nerves, and, through them, the thermogenic centre, on its application to the skin. The presence of guaiacol in the urine is attributed to the absorption of the vapors through the respiratory organs. The influence of guaiacol is chiefly seen in febrile conditions. Guinard (*Bull. Gén. de Ther.*, Oct. 30, '93).

After painting the skin with 31 grains of guaiacol, elimination by the kidney is manifested in a quarter of an hour; the proportion in the urine is greatest in from one and a half to four hours after and reaches 50 grains per quart. It decreases rapidly in six or seven hours, and in twenty-four hours there is no further trace in the urine. It is necessary in external application of the drug to cover the painted surface with an impermeable layer of taffeta. Linossier and Lannois (*La Méd. Moderne*, Feb. 7, '94).

Pure guaiacol passes rapidly into the urine, while after the application of a mixture with glycerin it appears much more slowly. Almond-oil interferes much less with absorption than glycerin. Stourbe (*Lyon Méd.*, July 15, '94).

Poisoning of Guaiacol.—A case of poisoning, in a child 9 years of age, has been reported by Wyss, in which $1\frac{1}{4}$ drachms were accidentally taken. In a

short time she became unconscious and cyanotic. The conjunctivæ became injected, the corneal reflexes diminished, and the pupil contracted and inactive. Vomiting (ejecta had odor of guaiacol) and profuse salivation were present. The pulse became rapid and weak and the breathing irregular. Cutaneous sensibility was diminished. Later on blood and bile-stained mucous were vomited. The urine was dark colored, of an aromatic odor, and contained bile-pigments and a small amount of albumin. The cyanosis gradually diminished and was followed by a deadly pallor. The respirations became frequent. Jaundice appeared and the patient died on the third day. The autopsy revealed an acute gastro-enteritis and parenchymatous degeneration of the liver and heart-muscle, acute hæmorrhagic nephritis, enlarged spleen, and ecchymosis in the pleura, peritoneum, endocardium, and pericardium. Several cases of death have been reported following the hypodermic administration of guaiacol, the patients dying within an hour in profound coma with every symptom of cardiac paralysis.

Even when ingested in toxic quantities, the drug is but slightly eliminated by the expired air. Small amounts of the drug, however, may be met with in the lung-tissue. Paul Binet (*Revue Méd. de la Suisse Rom.*, June, July, '93).

After 15½-minim doses of guaiacol, slight appearances of poisoning may supervene. These are characterized by a burning feeling in the stomach, nausea, etc. Kobert ("Intoxicationen," '94).

Fifteen and a half minims of a mixture of guaiacol, 150 parts, and iodoform, 20 parts, injected into the knee-joint of a girl of 8 years suffering from fungous arthritis. Cyanosis, dyspnoea, loss of consciousness, nausea, and temporary amaurosis supervened. Von Mosetig-Moorhof (*Deutsche med. Woch.*, No. 7, '94).

Treatment of Guaiacol Poisoning.—Soluble sulphates (Epsom or Glauber's salt) may be given freely in conjunction with mucilaginous drinks. Digitalis and strychnine hypodermically injected are useful, associated with heat to the extremities and counter-irritation applied on the abdomen. Emetics and the stomach-pump are valuable if used early, before the drug has been absorbed.

Therapeutics.—Guaiacol has been chiefly used as a remedy in tuberculosis, as an antipyretic in fevers. It may be given in pill, in capsule, in an alcoholic or oily solution, or by hypodermic injection, dissolved in sweet almond-oil (equal parts), or in sterilized neutral olive-oil (1 to 5). Liquid guaiacol may be administered by inhalation, its volatility adapting it for that purpose. It may also be given by inunction; the part being cleansed and dried, the guaiacol is painted over the surface, and after being left for about ten minutes the part is well rubbed and covered with some impermeable dressing. Its absorption is very rapid, guaiacol being found in the urine fifteen or twenty minutes after it is applied to the skin.

External applications of guaiacol increase the utilization of albuminoids by the organism and absorption of fat and diminish oxidation. Caporali (*Riforma Medica*, No. 175, '94).

TUBERCULOSIS.—In the early stage of this disease guaiacol reduces the fever, restores the gastric and intestinal functions, and improves the condition of the patient.

The principal results of clinical research may be summarized as follows: 1. Guaiacol is an excellent antipyretic. 2. The drug does not give rise to collapse, even in phthisical subjects with large cavities. In these patients, however, the application is almost invariably followed in from two to four hours by perspiration and rigors. 3. Compresses

are the best mode of application. 4. Chemically-pure crystalline guaiacol should be preferred to the ordinary fluid preparation. S. T. Bartoszewicz (*Yujno-Russkaia Med. Gazeta*, Nos. 23, 24, '91).

In tuberculous $\frac{1}{2}$ to $2\frac{1}{2}$ drachms applied to the extremities, back, and abdomen, and covered with cotton and gutta-percha. The action of the drug is manifested even in fifteen minutes. There is no irritation of the skin if the drug is of pure quality. S. Sciolla (*Deutsche med. Woch.*, No. 22, '93).

Four cases of tubercular disease in which the local application of guaiacol caused a marked reduction of the temperature. Guaiacol may be painted over the thigh or the back, the part being covered with an impermeable towel. Dosage can thus easily be managed. The quantity at the beginning was $\frac{3}{4}$ drachm, this amount being decreased at each treatment. The antipyretic action of guaiacol, employed as described, is not confined to tuberculous cases, but has given the same satisfactory results in pyrexias of erysipelas and pneumonia. L. Bard (*Lyon Méd.*, June 4, '93).

Carbonate of guaiacol, a 20-per-cent. solution in olive-oil, recommended in all forms of cystitis, but especially in the tuberculous variety. From 15 to 30 minims to be used once or twice a day; the addition of iodoform, 1 per cent., increases the efficacy. Colin (*Jour. de Méd.*, Jan. 26, '96).

Schetelig's method of giving pure guaiacol subcutaneously in acute pulmonary tuberculosis tried; 3 hypodermic doses, 1 of 15 minims and 2 of 10 minims, at four hours' interval, in one case brought the temperature from 104° F. to normal, with rapid amelioration of all the symptoms. Guaiacol is especially useful in the fever of the suppurative stage of the disease. A moderate perspiration usually follows the injection. Coghill (*Brit. Med. Jour.*, Mar. 7, '96).

From 1 to $1\frac{1}{2}$ drachms of the following solution may be injected at a dose without danger:—

R Iodoform, 15 grains.

Guaiacol, 75 grains.

Sterilized olive-oil, 3 ounces.—M.

There were 424 injections given to eighteen patients suffering from pulmonary tuberculosis; the effects are distinctly favorable. The injections should be given into the loose connective tissues of the back, shoulder, or thigh.

Careful asepsis should be maintained. A. Breton (*Jour. des Praticiens*, Dec. 19, '97).

The action of guaiacol injections in surgical tubercle studied. The liquid is used as a 1-in-10 to 1-in-20 solution in sterilized olive-oil. Rigid antiseptic precautions are required for the injections, the latter being made with a Roux syringe deeply into the granulation-masses, $\frac{1}{2}$ to 1 cubic centimetre of the solution being injected at three or four different points. This may be repeated once or twice every week, provided there has not been much irritation.

Number of observations of white swelling, etc., in which an extremely favorable result was obtained.

Guaiacol may also be used in the form of a dressing in certain open tuberculous conditions: thus gauze steeped in guaiacol solution (in olive-oil 1 in 10) and applied to the surface causes decrease of pain and the healthy condition of the tissues. Grégoire (*Thèse de Paris*, '97).

FEVER.—Guaiacol possesses strong antipyretic powers. It is perhaps best used by painting over the skin of the abdomen, the chest, or the internal aspect of the thigh, 30 or 40 drops being used for this purpose, as described above. These applications may be repeated. The decline in temperature is often great and rapid, but after reaching the lowest point the temperature will more rapidly attain its former height. A great feeling of depression is experienced by the patient and profuse sweating occurs. The temperature has reached the minimum, and chills at this time are not uncommon. The use of this drug for its antipyretic effect is not devoid of danger, and its action is not as lasting as that produced by the cold bath and by numerous other

antipyretic remedies. Guaiacol-carbonate has been used in typhoid fever, for its antiseptic action in the bowel, but such use is not to be advised.

On painting the skin with guaiacol in a case of typhoid fever, the temperature fell from 105.4° to 98.6° F. in three and a half hours without any disturbance of the circulatory or nervous system. Afterward the drug was used about twice daily, a fall of temperature occurring each time. The antipyretic effect is slower than that of the bath, but more permanent. After washing with soap and water, 30 drops should be slowly rubbed in the skin of the abdomen or thigh or painted over the surface, then covered with lint or wax-paper. Fifty drops should be a maximum amount. The urine should be watched carefully. The unpleasant odor caused by the drug may be to some extent overcome by the addition of oil of cloves. Da Costa (Med. News, Jan. 27, '94).

Use of guaiacol not recommended, as, although the fall of temperature is very marked, the sweating and rigors are very severe, and the influence on the disease is not lasting. Stolzenburg (Berliner klin. Woch., Jan. 29, '94).

Guaiacol mixed with tincture of iodine used in the treatment of pleurisy, in the following proportions: Tincture of iodine, 385 grains; guaiacol, 75 grains. The chest is thoroughly painted with it every night. The application is followed by a fall of the temperature, profuse perspiration, diuresis, and by a resorption of the fluid. Casavovici and Miron Sigalea (N. Y. Med. Jour., Mar. 3, '94).

Guaiacol applied externally is readily absorbed; its application is followed in most instances of fever by a gradual reduction in temperature, which reaches its lowest point between three and four hours after the application; the fall of temperature is almost always associated with profuse sweating; at a variable period, usually a short time after the lowest point is reached, the temperature rises rapidly, generally with marked chilly sensations, if not with an actual chill; the amount applied should rarely exceed $\frac{1}{2}$ drachm. Similar results fol-

low the absorption of guaiacol through any other channel. Owing to the weakening effects of its continued use and the disagreeable effects of its immediate application, its use as an antipyretic will be very limited. Thayer (Med. News, Mar. 31, '94).

This drug has a powerful antipyretic action. In all cases the reduction of temperature is accompanied by profuse diaphoresis, which may or may not be accompanied by a chill or chilly sensation. Great exhaustion is frequently produced. The effects may be obtained by from 30 to 50 drops, and great care should therefore be exercised, the drug being applied but once or twice daily, the initial dose not exceeding 30 drops. Its effect differs from the stimulating cold bath in being depressant. The main indication for its use is in diseases accompanied by high fever in which the cold bath cannot be applied, as well as in all other diseases accompanied by high fever in which irritability of the stomach prevents the use of other antipyretics. Friedenwald and Hayden (N. Y. Med. Jour., Apr. 14, '94).

Guaiacol has more effect in modifying the temperature about the beginning than toward the end of the acute fever. C. A. Dana (Med. Record, June 22, '94).

Applications of guaiacol over the spleen recommended in intermittent fever where quinine is not well borne or as an adjunct to the latter drug. Kohos (Gaz. des Hôp., Oct. 30, '94).

The external application of guaiacol may be dangerous, first, by the sudden fall of temperature which immediately follows the application, and, second, by the nervous depression produced by repeated applications. In typhoid fever the method should not be employed on account of the long duration of the disease; in erysipelas and pneumonia, on the other hand, it is very useful. In tuberculosis its effect is favorable only in a certain number of cases of interstitial granular formations without complications. Baird (La Semaine Méd., Aug. 17, '95).

Guaiacol internally excellent as an antiseptic in the typhoid fever of children. The following formula employed:

R. Guaiacol, 1 drachm.
Glycerin, 2 drachms.
Alcohol, 2 drachms.

M. Sig.: 1 to 6 drops in whisky and water every two hours, according to the age.

This treatment is continued throughout the course of the disease, the dose of guaiacol being increased or decreased according to the severity of the symptoms. Under this plan of treatment intestinal antiseptis is evidenced by the slight degree of tympanites, absence of sordes, and especially by the character of the stools, which are much less frequent and practically destitute of the very disagreeable odor that characterized the passages of patients before the introduction of treatment directed toward intestinal antiseptis. König (Jour. Amer. Med. Assoc., Oct. 5, '95).

Guaiacol deemed by many to be a depressant and a dangerous remedy where the circulation has suffered from long-continued fever. The writer has used it in a number of cases of typhoid fever with only the happiest results. When given internally guaiacol does not reduce the temperature to the same degree as when applied to the skin. McCormick (Brit. Med. Jour., Mar. 7, '96).

Remarkable success with guaiacol in many cases of cough of long standing, in which no tuberculous element could be recognized. A. Goldhammer (Med. Record, Oct. 23, '97).

Guaiacol used in the treatment of malarial intermittent fevers; 15 minims were rubbed into the axilla and covered with cotton. The average fall of temperature in $\frac{1}{4}$ hour was 1.6° , in $1\frac{1}{4}$ hours 2.3° , and after 4 hours the average fall was 3° . The fall of temperature was accompanied by a free perspiration and a marked improvement in the condition and comfort of the patient. No depression was noticed. Rogers (Ind. Med. Gaz., Jan., '98).

Eleven cases of serous pleurisy treated with a mixture of guaiacol, 1 part, and tincture of iodine, 4 parts, with favorable results. A drachm of this mixture was applied once daily to the affected side, which was then covered with wax-paper, cotton, and then with a bandage.

Besides this treatment the patients received only small doses of codeine or Dover's powder. In all cases the exudate became absorbed more quickly than was observed by the author under any other method of treatment.

By irritating the peripheral nerve-endings the guaiacol acts on the thermal and vasomotor centres; hence the reduction in temperature and increased absorption-power of the pleura. Besides, it acts in the blood-current directly as an antiseptic. Brosorowsky (Meditzinskoje Obosrenije, No. 1, '98).

Reduction of high temperatures by the external application of guaiacol tried with small quantities on young children suffering from broncho-pneumonia. The points in favor are: speedy reduction of temperature; ease of administration; and absence of ill effects, both locally and generally.

In a case of broncho-pneumonia in an infant, aged 10 months, guaiacol was rubbed gently into abdomen or chest-wall 76 times, and temperature was thereby reduced about 70 times. The reduction was most often 2 degrees, but at times was as much as 4 degrees.

The skin never became sore, even after 76 applications. No symptoms of collapse were observed, but rather the opposite. Stanley (Australasian Med. Gaz., Dec. 25, '99).

PAINFUL DISORDERS.—The analgesic effects of guaiacol have been utilized in the treatment of arthritis deformans, acute articular and muscular rheumatism, sciatic coxalgia, and pains of a superficial or deep-seated nature. The pains of orchitis and epididymitis are relieved by applying guaiacol in oily solution or in ointment (1 part to 10 or 15 of vaselin or lanolin).

In the treatment of epididymitis, an ointment composed of 2 to 5 parts of guaiacol and 30 of vaselin used with advantage. These good results may be explained by local action exercised upon the cutaneous nerve-endings, and the reflex action upon the cord and testicle, rather than by the absorption of the

drug. Balzer and Lacour (*Le Bull. Méd.*, Apr. 11, '94).

When analgesic effects only are sought, the guaiacol should be used with equal parts of glycerin; but if it be desired to produce an antithermic action, the drug ought to be used pure or else mixed with some vehicle that lends itself readily to dermic absorption. Ferrand (*Provincial Med. Jour.*, July 2, '94).

Guaiacol used to relieve pain in acute articular rheumatism, tubercular caries of the wrist, hysteria, locomotor ataxia, arthritis deformans, with excellent results and without the development of disagreeable symptoms. The painful part is first cleaned, then from 0.75 to 1.5 cubic centimetres of guaiacol are rapidly applied with a camel's-hair brush. After employing gentle friction the part is covered with a piece of gutta-percha. In some cases relief was permanent; in others the pain returned the next day. Brill (*Centralb. f. innere Med.*, Nov. 24, '94).

Good results obtained in sciatica and intercostal neuralgia from painting a mixture of equal parts of guaiacol and glycerol over the course of the nerves. No ill effects were noted. Ferrand (*Jour. des Prat.*, No. 30, '94).

Guaiacol recommended in pultaceous angina, phlegmonous tonsillitis, etc., in which diphtheria does not play any rôle. Equal parts of glycerin and guaiacol for adults; 2 parts of glycerin and 1 of guaiacol for children. Affected parts to be painted four times in twenty-four hours, making the last application late at night and the first early in the morning. Darboux (*Jour. de Méd. et de Chir. Prat.*, Jan. 10, '95).

Guaiacol recommended in cases of gonorrhœal orchitis. Crystalline guaiacol after previous melting may be applied to the affected part and to the groin by a brush; 31 to 46 grains may be used each time. A guaiacol ointment may be made thus:—

R Guaiacol, 1 $\frac{1}{4}$ drachms.
Vaselin, 1 $\frac{2}{3}$ ounces.

Tavitian (*Revue Gén. de Clin. et de Théor.*, Mar. 30, '95).

Results from the use of guaiacol in 52

cases of epididymitis, 50 of which were of gonorrhœal origin. A 10-per-cent. ointment made with vaselin or a 5-per-cent. used if the skin of the scrotum is tender. The scrotum is first washed with soap and with ether. This ointment is applied during the acute stage, and in from three to five days the fever, pain, and swelling disappear. In subacute stages the action of guaiacol is less active and very slight in chronic cases. After the acute stage it is best replaced by a 1- or 2-per-cent. ointment of extract of belladonna, with equal parts of simple ointment and unguentum diachyli. Salol internally, 15 grains *ter die*, is a useful adjunct to the treatment. Lenz (*Wiener klin. Rund.*, Nos. 4, 5, 6, '98).

Guaiacol will render painless intramuscular injections of gray oil, oil with calomel, and especially oily solutions of biniodide of mercury, frequently employed for a long time in the treatment of syphilis. Lagrange recommends the following formula:—

R Sterilized olive-oil, 20 drachms.
Mercury biniodid., 6 grains.
Synthetic guaiacol, 36 grains.

Should the physician inject every day, or every second day, in the region of the thigh, say, 30 grains of this solution, it will represent about $\frac{1}{4}$ grain of mercury biniodide. Bazin (*Semaine Méd.*, Mar. 22, '99).

ANÆSTHESIA.—As an anæsthetic guaiacol may be used in minor surgical operations. A dose of 1 or 2 drops dissolved in sterilized olive-oil is sufficient to obtain anæsthesia; five minutes should be allowed to elapse after the injection. Championnière considers guaiacol superior to cocaine, because much larger doses may be used with safety. No accidents were noticed except slight sloughing of the gums where it had been used for the extraction of teeth, which he attributed to a faulty method of injection or to a defective solution.

Guaiacol recommended as a local analgesic. Applied to burns in solution, 10 per cent., in olive-oil, it causes a disap-

pearance of the pain. It has been used with absolute success in the extraction of teeth. Anaesthesia is less rapidly produced than with cocaine, being complete only after seven or eight minutes; on the other hand, however, it appears to be much more durable. Anaesthesia is induced even in inflamed tissue. Lucas-Championnière (Le Bull. Méd., July 31, '95).

Guaiacol-oil is made by purifying olive-oil with chloride of zinc, then washing with alcohol and maintaining for some time at 100 degrees. The solution to be used is 20 per cent.

The method of procedure for the nose and throat is to apply the solution several times to the affected part by means of a piece of cotton-wool impregnated with the oil, and for the ear it is advised to instil 5 or 6 drops of tepid guaiacol-oil, after practicing a preliminary injection of tepid water, followed by the application of "phenosalyl." After instilling the drops, a plug of cotton-wool is inserted to absorb the redundant liquid. The anaesthesia takes longer to obtain with this agent than with cocaine, and no retraction of the tissues occurs.

Guaiacol-oil is equal to cocaine in its analgesic properties, while the danger of the shocks is absent. Laurens (Ann. Mal. de l'Oreille, Jan., '96).

Guaiacol recommended as a substitute when cocaine is contra-indicated. Used 36 times in the nose, pharynx, and larynx, and on the average obtains anaesthesia in 10 minutes. The following solution recommended: To olive-oil add 10 per cent. of dry zinc sulphate; heat over a water-bath one hour and add 12½ per cent. absolute alcohol; shake several times during twenty-four hours; decant and add 5 per cent. guaiacol. W. G. Holloway (Internat. Med. Mag., June, '96).

Guaiacol used advantageously in treating painful cases of orchitis and epididymitis. In one of the cases one application of guaiacol gave immediate relief, and after three applications all pain and tenderness had gone, only a slight swelling remaining. William Nuss (Bull. Cleveland Gen. Hosp., 1, p. 25, 1900).

ERYSIPELAS.—Guaiacol dissolved in alcohol or oil has been employed as an application in this disease. Twenty or 30 drops may be painted over the infected area and slightly beyond. The pain is promptly relieved and the temperature lowered by this method of medication.

C. SUMNER WITHERSTINE,

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GUARANA.—Guarana is a dried paste, consisting chiefly of the crushed or pounded seeds of *Paullinia cupana* (*Paullinia sorbilis*): a climbing plant in the eastern part of South America, and especially in Brazil. It contains an alkaloid, guaranine, which is identical with caffeine, and theine. Guarana is slightly soluble in water as well as in alcohol.

Preparations and Doses.—Guarana, ¼, to 2 drachms.

Extract of guarana, fluid, ¼, to 2 drachms.

Physiological Action.—Guarana has a slightly bitter and astringent taste. It contains sufficient tannin to give it a slight astringent action. Farther than this, its physiological action is that of caffeine.

Therapeutics.—It is most frequently given for sick headaches or migraine. It is especially recommended when the pain affects the right side of the head. It shortens the attacks and increases the interval between them. From 30 to 60 grains of the powder, or an equivalent of the fluid extract, may be taken every night and every three hours during the attack. It is also given as a tonic when nerve-action is impaired, as in convalescence from acute disease, debility, etc.

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GUNSHOT WOUNDS OF ABDOMEN.

See ABDOMEN.

GUNSHOT WOUNDS OF BRAIN. See

WOUNDS OF HEAD.

GUNSHOT WOUNDS OF THE HEAD.

See HEAD, WOUNDS AND INJURIES OF.

GUNSHOT WOUNDS OF THE STOMACH. See ABDOMEN.

H**HÆMATOPORPHYRINURIA.**

Definition.—Evacuation of urine containing hæmatoporphyrin, *i.e.*, a coloring matter resembling hæmatin, but containing no iron.

Symptoms.—The urine is dark-red or brown (resembling port-wine). The ordinary reactions for hæmatin or hæmoglobin do not give positive results. Examination by means of the spectroscope reveals characteristic absorption-bands.

Etiology. — Hæmatoporphyrinuria is the consequence of prolonged use of sulphonal.

Case of hæmatoporphyrinuria showing the enormous amount of hæmoglobin that may be destroyed. In the writers' case about one-seventeenth of the hæmoglobin was destroyed and wasted in the urine during twenty-four hours in the form of hæmatoporphyrin. Such a loss of blood-pigment sustained for a prolonged period of time will soon lead to severe degrees of anæmia. This patient had been taking from 20 to 60 grains of sulphonal nightly for several years, but recovered when the drug was stopped. J. Tyson and A. C. Croftan (Phila. Med. Jour., May 17, 1902).

F. LEVISON,
Copenhagen.

HÆMATOSALPINX. See UTERINE ADNEXA.**HÆMATURIA.**

Definition.—Evacuation of urine containing blood.

Symptoms.—Urine containing but a

little blood may not give any indication of its presence to the naked eye; but, when the quantity is larger, it presents a characteristic smoky appearance; when more abundant the fluid has a more or less pink or red color, while the surface presents a tinge of green; in extreme cases it looks almost like pure blood. After a time a brownish or grayish, gum-mous, flocculent sediment is deposited. When the blood is abundant it often separates from the urine in distinct clots. Although the appearance of the urine is very characteristic, various other coloring matters may be contained in the urine and give rise to delusions. These are phenol, santonin, bile-pigment, the coloring matter of rhubarb, senna, etc.

Attention called to the hæmaturia which not infrequently follows the too-free use of rhubarb. The origin of the hæmorrhage in these cases is due to actual renal lacerations in the excretion of the crystals of oxalate of lime, in which substance this plant is particularly rich. Boyd (Lancet, Oct. 24, '91).

TESTS.—The presence of blood may be proved by different tests.

1. *Heller's Test.*—A few cubic centimetres of urine are rendered alkaline with caustic soda and heated in a test-tube to the boiling-point; when blood is present the fluid becomes dark green; the phosphates are deposited as a flocculent sediment carrying with them the coloring matter of the blood by which they are colored red, or, rather, rusty

brown. The alkaline solution of hæmoglobin is dichroitic; it shows a green tinge in thin layers and a red in larger ones, while in the alkaline solution of santonin the coloring matter of rhubarb, senna, etc., are not dichroitic and take on a violet hue after a time.

2. *The Guaiac Test (Almén-Schönbein).*—One cubic centimetre of recently-prepared tincture of guaiac is carefully mixed with an equal volume of ozonized oil of turpentine, *i.e.*, turpentine-oil which has for some time been exposed to the influence of air. The mixture is cautiously poured upon the specimen of urine to be tested and will superpose itself forming on the point of contact a gray or greenish layer; when blood is present a beautiful indigo-blue stratum will appear immediately above the gray ring; when shaken the mixture will take a light-blue color. The guaiac test is very delicate, indicating blood in the proportion of 1 to 2000 or more.

Blood in the urine gives a blue color with tincture of guaiac, in the presence of turpentine or hydrogen peroxide. Pus gives this blue color with the tincture, without the addition of an oxygen-containing substance. Vitali and Brücke had endeavored to find the cause of the blue reaction with pus, and had found that a watery extract of pus was also able to turn the guaiac tincture blue. Personal experiments have shown that a chloroform extract of pus turned guaiac blue and the substance in the extract proved to be a nucleoproteid, the presence of which in the leucocytes was responsible for the guaiac reaction of pus. K. Brandenburg (*Münchener med. Woch.*, Feb. 6, 1900).

3. *The Hæmin Test (Terchmann).*—Some of the sediment of the urine or of the red phosphates deposited after addition of caustic soda is collected and dried. A small amount is placed on an object-glass and completely dried by

slowly warming. When it is fixed on the surface of the glass, some common salt is rubbed on it, a fine hair is placed across the preparation, a few drops of glacial acetic acid are added, and the whole is covered with a cover-glass. The object-glass is slowly heated to the boiling-point of the acetic acid and then cooled. When blood is present the characteristic small, reddish-brown crystals of hæmin will appear, which are easily detected by the aid of the microscope.

4. *Spectral Analysis.*—Examination of urine containing oxyhæmoglobin in the spectroscopic reveals two distinct absorption-bands between the lines *D* and *E* of Fraunhofer; recently-passed urine never contains oxyhæmoglobin, but methæmoglobin (a modification of hæmoglobin containing more oxygen than hæmoglobin, but less than oxyhæmoglobin). By decomposition of the urine or by addition of a solution of ammonia the methæmoglobin is reduced to hæmoglobin, which again forms oxyhæmoglobin when shaken with air. The methæmoglobin gives rise to the same two absorption-bands as the oxyhæmoglobin, but, besides, to a characteristic band in red, between *C* and *D*.

5. *Microscopical Examination.*—This is the most reliable test for hæmaturia. The urine is treated in a centrifugal apparatus and the sediment examined; even when the amount of blood is too small to alter the color of the urine the corpuscles of blood are easily detected by this method. Ordinarily the corpuscles are normal in appearance, but they do not accumulate in rolls; when the urine is dilute or alkaline, they are large, spherical, and almost colorless, commonly very transparent, whereas in concentrated urine their contour is irregular and indented; in some cases the corpuscles are broken up (fragmented);

in others, casts of renal tubuli formed by blood-corpuscles may be seen.

The admixture of blood to the urine may take place in the kidneys, the ureters, the bladder, or the urethra; in order to ascertain the origin of the blood, it is necessary to subdivide the urine when voided into several parts. The first portion voided may contain blood of urethral origin, and the urine last voided show none whatever.

When the portion last obtained contains much more blood than the first, the bladder probably is the seat of the bleeding. The endoscope will then generally allow the direct inspection of the bleeding-point of the mucous membrane of the bladder.

Too much value should not be placed upon so-called typical cell-elements in determining, by microscopical examination, the source of the hæmorrhage. It is often impossible to distinguish between deep urethral and vaginal cells, between the latter and superficial vesical cells. Transitional cells are often misleading, and the typical caudal cell from the renal pelvis is rarely seen. Charles Smith (Boston Med. and Surg. Jour., July, '93).

When the bleeding is caused by lesions of the ureters or of the calyces, cylindrical coagula or casts of the calyces may be found in the urine.

When the bleeding has taken place in the kidneys the blood is very intimately mixed with the urine; the corpuscles are often broken up or massed together, and casts of the renal tubes are commonly found.

Where the specific gravity of the urine is low the hæmorrhage is apt to be renal; where it is high, the lower urinary passages are usually the seat of origin. Otis (Jour. Cut. and Genito-Urin. Dis., Nov., '91).

If the bleeding is from the urethra it may ooze between the periods of micturition; if from the neck of the bladder,

it is more particularly noticed at the end of micturition; if from the bladder, it is usually very abundant, persistent, and more likely to clot, and accompanied by bladder irritability; if from the kidney, the blood is generally mixed with the urine, although, if the quantity is large, characteristic urethral clots may be found. F. R. Eccles (Brit. Med. Jour., June 5, '97).

The recognition of blood-casts in the urine forms the most conclusive proof of the renal origin of hæmaturia. L. J. Harvey (Med. News, June 25, '98).

Hæmorrhage due to renal calculus is usually small in amount and appears at more or less prolonged intervals; it is increased by movements of the body, and is appreciably diminished by rest in bed. Hæmorrhage from a renal tumor is generally more profuse and less transient than from a calculus, and in some cases it is so copious as to cause marked anæmia. Unlike the hæmaturia of renal calculus, that following tumors is more likely to occur during the night while the patient is in the recumbent posture. The presence of a persistent swelling in the renal region, associated with considerable hæmaturia, is of significance, and may be held as clearly indicating the presence of a neoplasm in the kidney. Hæmaturia from tuberculous disease is frequently absent for long intervals, is seldom so severe as from stone, and is not increased by exercise. In addition to the presence of tubercle bacilli, it has been noticed that the quantity of albumin is generally in excess of that accounted for by the blood, and in the later stage, when pus appears in considerable quantity, the pus and blood are not so rapidly or so completely precipitated in the urine as in the presence of calculous pyelitis. Newman (Lancet, July 9, '98).

Etiology.—Hæmaturia is more frequently observed in men than in women or children. The blood in hæmaturia may come from the kidneys, their pelvis, the ureters, the bladder, or from the urethra.

Bleeding from the urethra may be

caused by acute or chronic gonorrhœa, by traumatism (calculi, introduction of catheter), by polypoid excrescences, or malignant tumors. It has been observed as a result of venereal excess or as an accompaniment of the first coitus after a long period of abstinence.

Case of hæmaturia, at first paroxysmal and later more constant. Fibrous clots were frequently present, and the first portion of the urine was often more deeply colored than the later portion. An operation showed that the condition was caused by numerous small varicose veins in the prostatic portion of the urethra. Krauss (Wiener klin. Woch., July 9, '96).

Characteristics of idiopathic hæmaturia: It is hereditary, familial, and congenital. It may be persistent for many years, but vary in extent. All cases are liable to paroxysmal exacerbations, which are usually accompanied by slight pyrexia, malaise, headache, vomiting, and slight pains in the back or limbs. The duration of these exacerbations is usually several days, but seldom exceeds a week or at most a fortnight, and after the first few days the blood gradually lessens in amount. Idiopathic hæmaturia is not associated with œdema nor with ascites, nor with the cardiovascular changes following ordinary nephritis. The hæmorrhage is not due to the presence of uric acid nor of oxalates. The specific gravity of the urine is not unduly low. It varies from 1.015 to 1.030. The quantity of urine passed is not above or below normal. The reaction is acid or neutral. None of the subjects of idiopathic hæmaturia were hæmophilic. L. G. Guthrie (Med. Press, May 7, 1902).

The causes of bleeding from the bladder are traumatism (calculi); diseases of the bladder, acute or chronic; varicosities of the veins (vesical hæmorrhoids); ulcerations of the mucous membrane, diphtheritic or tuberculous; tumors, especially cancer of a villous and fungous nature; parasites, such as *Distoma hæmatobium*, or Bilharzia, and *Filaria*

sanguinis; it may also occur in hæmorrhagic diathesis, in hæmophilia; and also in infectious fevers, variola, etc.

Bleeding from the pelvis or the ureters is generally caused by calculi or by tuberculous disease, also by acute infectious diseases of hæmorrhagic character; by parasites (distoma and filaria).

Case of a 13-year-old girl who had suffered for two years from a painless hæmaturia, which became progressively more severe. The cystoscopic examination showed that the blood came from the left ureter. The corresponding kidney was extirpated, and upon macroscopical examination seemed to be healthy. Upon microscopical examination, however, the kidney was found affected with chronic nephritis. Hofbauer (Centralb. f. innere Med., No. 30, 1900).

Bleeding from the kidneys is frequently due to irritating poisons, such as cantharides, turpentine, etc.; very large doses of quinine and salicylic acid are said to have produced renal hæmaturia. Different diseases of the renal blood-vessels may cause bleeding; for instance: embolism of the renal artery, thrombosis of the veins, aneurism; traumatism.

Case of hæmaturia in which, medical treatment failing, surgical interference was resorted to, and the kidney fixed about two months after the time of her first visit. The hæmaturia continued as before; the kidney was then removed, and the patient made a complete recovery. On examination, its substance was apparently quite normal, but the mucous membrane of the pelvis was red, thickened, and pulpy, and covered with minute papilliform elevations and rugæ, which gave its interior a curiously roughened appearance. On microscopical examination myxangiomatic changes were found in the submucous tissue of the pelvis, and it was thought that the hæmaturia had been caused by them. Myles (Med. Press and Circular, Aug. 23, '99).

Recorded cases of "essential" renal hæmaturia classified as regards etiology: Hæmophilia; vasomotor disturbances; mechanical causes; kidneys which are the seat of nephritis; and cases which cannot be classified because imperfectly recorded, the kidney having been rarely submitted to microscopical examination. Floderus (Cent. f. Chir., Aug. 26, '99).

Painless hæmaturia occurring in young adults is very often due to an engorgement of the papillary elements of the Malpighian pyramid and to a plexiform mesh of dilated vessels covering the papilla itself. The vascular change is due probably to a localized patch of interstitial nephritis, impeding the circulation in the boundary layer of the pyramid. The site of the disease is only apparent on opening the renal pelvis, when a vivid red papilla assuming the aspect of a tiny villous growth may be seen standing out in strong contrast to the pale papillæ around. The writer asserts that the removal of this vascular papilla with a sharp scoop is sufficient to arrest a renal bleeding which no drug can control. Two personal cases successfully treated by this method. Fenwick (Brit. Med. Jour., Feb. 3, 1900).

Case in which a boy, aged 7, ate about 100 grammes of stewed rhubarb at midday on May 25th. At bedtime he passed 80 cubic centimeters of turbid, reddish-brown, dichroic urine, which was acid and of specific gravity 1029. It contained numerous red corpuscles, and gave the reactions of blood. Schulthess (Corr.-Bl. f. Schweiz-Aerzte, Sept. 15, 1903).

Parasites (*Distoma hæmatobium*—*Filaria sanguinis*—echinococcus); also more rarely acute nephritis, especially scarlatinous. In Bright's disease hæmaturia is observed also when malignant neoplasms are present. Renal hæmaturia may be caused by scurvy, hæmophilia, etc.; it occasionally accompanies infectious diseases, such as variola, morbilli, scarlatina, typhoid fever, cholera, exanthematous typhus, recurrent fevers, yellow fever, erysipelas, etc.; it is rarely

seen in syphilis, but in intermittent fever it is a frequent symptom (see MALARIAL FEVERS).

In some cases the hæmaturia is idiopathic, and is not to be explained by any of the above-mentioned etiological factors.

Hæmaturia observed consecutive to mountain-sickness. Luzzatto (Gaz. degli Ospedali, May 1, '98).

Two cases of hæmaturia of pregnancy; one developed in the seventh month, the blood coming from the right kidney; in the second case the hæmaturia occurred in the sixth month. In all there are about 12 reported cases. The bleeding may be either vesical or renal, but is practically always associated with a distinct lesion. Guyon and Albarran (La Presse Méd., No. 84, '99).

Prognosis.—The prognosis of hæmaturia depends on the quantity of blood lost and the gravity of the disease which causes the bleeding.

Treatment.—In all forms of hæmaturia rest and cold are the most important therapeutics; in bleeding from the urethra and the bladder cold may be applied by injections of ice-water or externally; in bleeding from the urethra compression may be useful; also astringent injections have been employed (nitrate of silver, acetate of lead, tannic acid, perchloride of iron, etc.); when the bleeding is accompanied by painful micturition, narcotics are recommended.

In cases of vesical hæmaturia, injections into the bladder, after it has been thoroughly cleared of blood, of $\frac{1}{100}$ solution of tannin, recommended. Donna-dieu (Med. Chronicle, July, '93).

Bleeding from the ureters, pelvis, or kidneys is treated by rest, cold, and internal medication of secale, ergotine, tannic acid, arbutin, acetate of lead, perchloride of iron, fluid extracts of hamamelis Virginica or of hydrastis Canadensis. In chronic cases of hæmaturia the balsams may be tried.

Case of recurrent nephritis with severe hæmaturia treated by the subcutaneous injection of gelatin. Six drachms of a 2-per-cent. solution of pure gelatin in physiological saline solution injected beneath each clavicle. This was repeated next day, and followed by the oral administration of half a litre of 10-per-cent. gelatin solution daily for a week. All previously tried hæmostatics had failed. Gelatin was speedily and permanently successful. The pain was not great and the alarming after-effects reported by Boinet, Barth, and others did not occur. Schwabe (*Ther. Monats.*, June, 1900).

Case of obstinate and dangerous hæmaturia associated with pain in the right lumbar region. After prolonged and fruitless treatment by other means, 200 cubic centimetres of sterile 25-per-cent. solution of gelatin were injected subcutaneously, occasioning much pain, but promptly stopping bleeding. Cossner (*Münchener med. Woch.*, 48, No. 2, 1901).

An ounce of normal saline solution to which 2 per cent. of pure gelatin is added and given subcutaneously, together with the internal administration of 1 drachm (4 grammes) of a 10-per-cent. gelatin solution has been very effective in relieving a personal case of hæmaturia in a young woman 25 years of age. Where a nephritis exists the internal administration of the 10-per-cent. solution should be avoided, as hæmoglobinuria is increased and renal casts appear in large numbers, and danger of uræmia is induced by such large doses.

But, when given subcutaneously with an interval of twelve or twenty-four hours, the hæmorrhage from the kidneys or nose stops immediately.

Some patients suffer considerable pain from these injections, while others do not. No abscesses have resulted, because the solutions were rendered aseptic and the injections were given under careful antiseptic precautions. Duffield (*Harper Hospital Bull.*, Dec., 1901.)

When the bleeding is caused by calculi or by tumors these are to be removed by operation, if possible; when the blood comes from the kidneys and only one

kidney is diseased, it may be necessary to remove the diseased kidney; in some instances only an exploratory incision has been made, the kidney has been replaced after a careful examination by which no reason for the bleeding was found, and the operation has resulted in complete recovery. (For the treatment of malarial hæmaturia see MALARIAL FEVERS.)

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HÆMOGLOBINURIA.

Definition.—Evacuation of urine containing the coloring matter of blood (but no corpuscles).

Symptoms.—The urine varies in color from smoky to pink or red, sometimes almost black; the color has been compared to that of porter, coffee, or portwine. The urine is ordinarily turbid, acid, of variable specific gravity, and highly albuminous; it deposits after some time an abundant, chocolate-colored, grumous sediment, which microscopically is seen to consist chiefly of granular hæmoglobin, mixed with renal casts, hyaline and fatty, sometimes also with crystals of hæmatoidin, uric acid, and oxalate of lime; occasionally a few corpuscles of blood may be found. The presence in the urine of hæmoglobin, or more correctly of methæmoglobin, is demonstrated by different tests, as Heller's test, the guaiac test, the microscopical examination, and spectral analysis (see HÆMATURIA). By spectral analysis two absorption-bands are found between *D* and *E* and a third between *C* and *D* of the Fraunhofer lines.

Idiopathic, or paroxysmal, hæmoglobinuria is characterized by attacks of hæmoglobinuria separated by free intervals of days, weeks, or months. Two attacks have rarely been observed in one day; they are ordinarily caused by cold,

especially to exposure of hands or feet (Pavy, Muiri, Lichtheim, Rosenbach). The attacks last from three to twelve hours, and are preceded for a brief period by a chill or rigor, itching of the skin, languor, a sense of weight or dull pain over the kidneys, aching pain or stiffness in the legs, and nausea or vomiting. Shivering sets in and generally there is fever with rise of temperature to 40° C. (104° F.) and still higher. The fever continues for some hours and ends with profuse perspiration. The attacks are sometimes followed by an eruption of urticaria. The urine, which was normal before the attack, becomes dark and remains so during some hours, after which it gradually resumes its normal appearance. The liver and the spleen have in most cases been found swelled and tender. After the attack the patient is very much exhausted for some time, the skin and the mucous membranes being pallid.

There are three stages in the production of hæmoglobinuria: Alteration of the blood (pre-existing); alteration of circulation (paroxysmal); kidney lesion (usually only functional). The blood-changes may affect the corpuscles or the plasma. The globules become in part disintegrated and the hæmoglobin escapes. The alteration in the plasma consists of a power to cause dissociation of the hæmoglobin from the corpuscles. The circulatory changes are produced by vasomotor disturbances and induce paroxysms by causing hæmoglobinæmia. The kidney lesion consists of a temporary loss of the property possessed by the epithelium of the convoluted tubules of decomposing the hæmoglobin and separating the iron. This kidney lesion is essential to the appearance of hæmoglobinuria. Ettore Chiaruttini (*Archivio per le Sci. Med.*, vol. xxiv, No. 1, 1900).

Etiology.—Hæmoglobinuria can experimentally be caused by injection, into the veins of animals, of dissolved hæmo-

globin or of substances which disintegrate and dissolve the corpuscles of blood, such as water, glycerin, and the salts of the bile-acids; the same result may be obtained by inhalations of arseniureted hydrogen, sulphureted hydrogen, ether and other poisons, or by ingestion of poisons such as arsenic, chlorate of potassium, etc.; transfusion of blood or serum of another species of animal also causes hæmoglobinuria.

1. In man hæmoglobinuria is caused by poisons: *i.e.*, sulphuric acid, hydrochloric acid, arsenic, chlorate of potassium, pyrogallallic acid, naphthol, nitrobenzol, poisonous mushrooms, etc.

[Carré (*Bull. Gén. de Thé.*, '92) contends that large doses of quinine are capable of producing a condition of methæmoglobinuria. F. LEVISON.]

Two cases of hæmoglobinuria in which the patient became suddenly ill with jaundice and hæmoglobinuria. The latter lasted three days, then the urine became normal. Jaundice and distinct swelling of the spleen continued for seven days longer and the aspect of the case in general was that of an acute infection. No micro-organism could be found in the blood; but the patient had eaten blood-sausage the evening before his illness, and it is not unlikely that intoxication occurred in this way. Klemperer (*Charité Annalen*, 20, p. 131).

Series of fifteen cases of hæmoglobinuric fever, defined as an acute febrile disease, probably of malarial origin, and characterized by the occurrence of an extensive and rapid hæmolysis. Hearsey (*Brit. Med. Jour.*, Jan. 26, 1901).

2. It may be caused by extensive burns, insolation, transfusion of lamb's blood and occur as a symptom of severe infectious diseases (scarlatina, typhoid fever, diphtheria, intermittent fever, icterus). Hæmoglobinuria has been observed by Winckel as a special disease of the newborn. In severe malarial fevers with icterus, hæmoglobinuria has often been noticed; these fevers occur mostly

in tropical climates in the three continents; when the patient returns to a temperate climate the hæmoglobinuria ordinarily ceases; the cases may be light or severe; the severe cases end lethally either by exhaustion, by complete cessation of the secretion of urine or by causing a uræmic condition of the patient.

Case of hæmoglobinuria of hæmatogenous origin from the effects of an intra-uterine washing with carbolic acid.

On the eleventh day the patient died, after a number of rigors having appeared on different days. On section there was found a putrid endometritis and acute parenchymatous nephritis, with infarction of the urinary tubules with hæmoglobin. Krukenberg (*Centralblatt für Gynäk.*, Aug. 1, '91).

Three cases of transient hæmoglobinuria from muscular exertion. In two the cause was a foot-race; in the third, a game of lawn-tennis. The blood was healthy, but the corpuscles were destroyed by some product of the unusual muscular exertion, probably carbonic acid. L. Dickinson (*Brit. Med. Jour.*, May 19, '94).

Malarial hæmoglobinuria is due to demineralization of the blood caused by morbid changes in the liver from malaria. Small doses of quinine, just enough to destroy the plasmodium, and subcutaneous injections of sodium-chloride solution, to antagonize destruction of red corpuscles, are indicated. Tous-saint (*La Presse Méd.*, No. 41, 1901).

After studying the data of 202 cases of this disorder the writer concludes that it always occurs in persons suffering repeated attacks of malaria, such having been the case in every case reported. It nearly always follows one or more mild paroxysms of malaria at the proper time for its next exacerbation; there was but one exception to this reported. It has all the characteristics of malaria, chill, fever, and sweat. Where adequate examination of blood is made, the hæmatozoa of malaria are found; such was the case in 41 per cent. Its habitat, that of most violently malarious districts (all cases reported were

such) are sufficient to establish malaria as a causative agent, if not the only one. Hæmoglobinuria is not due to the use of quinine. It should be given in large doses and many patients are lost, owing to the insufficiency of the doses of quinine employed. The average dose should be about 40 grains of quinine a day, preferably administered by hypodermic intravenous injection. When the patients are seen late, methylene blue, in doses of from 3 to 6 grains, should be combined with the quinine. Walter Shropshire (*Jour. Amer. Med. Assoc.*, Sept. 5, 1903).

3. Hæmoglobinuria is caused by dissolution of blood, *i.e.*, in scurvy, purpura, rubrum maculosus, variola hæmorrhagica, and may also be seen in typhus.

4. The intermittent, or paroxysmal, hæmoglobinuria is a distinct affection which has especially been studied in the last years. It has commonly been observed in men, seldom in women.

The attacks, which have already been described, vary much in frequency, are usually traceable to exposure to cold, especially of hands or feet. The disease is characterized by intermittent dissolution of the red corpuscles of the blood during the attacks. Ehrlich proved this by placing a ligature around the finger of a patient and exposing it to cold; in healthy persons this procedure does not alter the composition of blood, but in patients suffering from paroxysmal hæmoglobinuria the blood drawn from a finger treated in this way will be disintegrated, the blood-corpuscles will be broken up, and the hæmoglobin dissolved in the serum, which therefore has a pink instead of a yellowish color.

Case of paroxysmal hæmoglobinuria which was apparently caused by sudden exposure to cold water in bathing, and which subsequent examination showed to be due to cold, as the blood of a ligated finger which had been exposed to freezing was greatly disintegrated and not unlike that found in the urine.

Sweet (New Zealand Med. Jour., Oct., '96).

During the attacks the number of the red corpuscles is diminished; after the attack many small red corpuscles and hæmatoblasts appear in the blood.

1. Hæmoglobinuria is rarely pure; it is generally accompanied by a real destruction of red blood-corpuscles at the moment of the attack.

2. The loss of hæmoglobin greatly surpasses the loss of red corpuscles, as in one case the loss of hæmoglobin equaled one-third of the normal, while the loss of red corpuscles only equaled one-ninth of the normal.

3. The resistance of the blood is much diminished at the time of the attack. It is found that the red corpuscles destroyed at the end of twenty-four hours during the attack are equivalent to one-third of the total count, while during the normal state not one-quarter of the normal count is destroyed.

4. The so-called paroxysmal hæmoglobinuria being only a symptom, and not a morbid entity, it is important to examine in every case the modifications in the blood in order to find out if different varieties of hæmoglobinuria are associated with different changes in the blood. Vaquez and Marcato (*Archives de Méd. Exper.*, Jan., '96).

Case in which the hæmoglobin in the urine, although it showed most of the usual reactions, on the addition of hydrochloric and acetic acids became split up into a soluble peptone and an insoluble ferric and phosphoric body, and no longer showed Teichmann's hæmin crystals. Adolf Jalles (*Wiener klin. Rund.*, July 8, 1900).

Probably the paroxysms are in some cases caused by the presence of parasites in the blood; in animals (oxen, horses) a similar disease has been observed. Kroghs and von Hellens found in the blood of diseased oxen parasitic corpuscles analogous to the plasmodium of malaria.

Various authors have observed intermittent hæmoglobinuria in connection with syphilis.

Post-mortem upon an artisan with a syphilitic history, subject to paroxysmal hæmoglobinuria, first brought on after a severe chilling three years before. The kidneys were found in a healthy condition except for some amount of hæmic pigmentation of the tubular epithelial cells, and a coagulation-necrosis of a number of the renal cells, causing the appearance of vacuolization. Germoing (*Med. Press and Circular*, Aug. 29, '88).

Typical case of paroxysmal hæmoglobinuria which occurred in a man who acknowledged the three taints of malarial fever, syphilis, and alcoholism. For eight years, every winter, upon the least chilling, occurred paroxysms of hæmoglobinuria. The paroxysms began with chilly sensations, followed by fever and sweat. Brunelle (*Le Bull. Méd.*, June 10, '91).

[Courtis-Suffit (*Méd. Moderne*, '95) observed a case in a child of 5 years who showed indubitable signs of inherited syphilis. Parry (*Jour. of Railway-surgeons*, Fort Wayne, '94) and Gubarew (*Petersburg. med. Woch.*, '94) also mention cases of intermittent hæmoglobinuria in syphilitic patients. F. LEVISON.]

Prognosis.—In the hæmoglobinuria caused by poisons, infectious diseases, septic diseases, etc., the prognosis is determined by the gravity of the primary disease; the intermittent hæmoglobinuria is for a long time compatible with life; the patients never die during an attack; recovery has been observed, but often the disease continues for many years.

Treatment.—When hæmoglobinuria is a symptom the treatment must be directed toward the fundamental disease; in cases connected with syphilis an anti-syphilitic treatment has been of use, as well as quinine in hæmoglobinuria of malarial origin.

In malarial hæmoglobinuria in the early and free use of quinine depends the safety of the patient. As a first dose, if the temperature be above 103° F., 20 grains recommended, continuing its exhibition in 10-grain doses every three hours afterward for twenty-four hours,

then dropping to 5 grains every three hours. If quinine blindness follow, the drug is to be stopped. With each of the first two doses are combined 2 grains of calomel, followed, in ten hours after the last dose of calomel, by a Seidlitz powder.

To allay the vomiting bismuth and opium are used. Chambles (Med. Bull., May, '91).

Case of so-called essential hæmoglobinuria, in a man of 35 years, cured by injections of mercury. Koster (Therap. Monat., Feb., '93).

In every instance of hæmoglobinuria, so-called essential, occurring in a child, the specific treatment should be employed even in the absence of any sign of hereditary syphilis. Courtois-Suffit (La Méd. Moderne, Mar. 2, '95).

In paroxysmal hæmoglobinuria change of climate, dietetic treatment, iron, quinine, and arsenic have been recommended.

F. LEVISON,
Copenhagen.

HÆMOPHILIA. — Gr., αἷμα, blood, and φιλεῖν, to love.

Definition.—Hæmophilia is an inherited or acquired disorder of the vascular system characterized by an abnormal liability to severe and sometimes uncontrollable hæmorrhages.

Symptoms.—The condition is generally discovered by accident, a slight wound, the extraction of a tooth, the application of a leech, vaccination, etc., being followed by profuse and sometimes dangerous bleeding. Epistaxis is of frequent occurrence. In women this is especially the case, because the hæmophilic process mainly manifests itself through the mucous membranes, and menorrhagia, metrorrhagia, post-partum hæmorrhage, etc., are often suffered from.

Pregnancy and labor do not present the danger for an hæmophilic woman that might be supposed. Of 130 cases,

the death of the mother occurred only in 3 and abortion in only 16 cases. R. Kolster (Wratsch, No. 28, '95).

Case of a girl, aged 11 months, in whom from the third week of life there had been continuous and spontaneous hæmorrhages from the nose, mouth, and rectum, and into the substance of the skin, without, however, impairing in any manifest way the child's development. There was a history on the father's side of hæmophilia, but not on the maternal side. The patient was the only living one of their children; there had been two other girls who had died in infancy, but had not shown any signs of hæmophilia. Comby (Bull. et Mém. de la Soc. Méd. des Hôp., June 25, '97).

Patients subject to hæmophilia constantly exhibit mental peculiarities of definite form. The most important and the most common mental peculiarity is an inability (it is more than unwillingness) to tell the truth about their condition, even when they have had repeated and alarming experience of their defect. Frequently they will persist in obstinate denial of their liability to bleed, even when the hæmorrhage is going on, and resisting all efforts to check it. C. T. Dent (Brit. Med. Jour., Apr. 23, '98).

In men arthritic symptoms are frequently observed, especially during cold and damp weather, the knees being most prone to pseudorheumatic manifestations which are sometimes accompanied by fever. The joint-symptoms are often the precursor of an approaching hæmorrhage.

Hæmophilia does not always manifest itself by external hæmorrhage. The arthritic complications of hæmophilia are generally the result of hæmorrhage into the joint-cavities, but there is no antagonism between hæmophilia and articular rheumatism. Frederick S. Eve (Lancet, Nov. 16, '89).

Three stages described of joint-troubles in hæmophilia: (1) the stage of hæmarthrosis; (2) stage of inflammation; (3) stage of retrogressive changes with deformity. The painless, sudden onset in pale young men marks the first stage.

Hæmorrhages in the skin would complete the diagnosis. The second stage is strikingly similar to the white swelling of tuberculous arthritis. The author has three times made a mistaken diagnosis, two of the three cases having suffered death in consequence, from hæmorrhage after operation; the third recovered. Koenig (*L'Encéphale*, June 25, '92).

Etiology.—According to Henry, hæmophilia is the most hereditary of all diseases. Although a fixed law, such as Nasse's—namely, that transmission of the disease through females that are themselves not hæmophilic—cannot be accepted as universal, 30 per cent. of the cases studied by Kolster, for instance, were found to be governed by this peculiar form of heredity.

The most remarkable family of bleeders of which we have any account is the one living in Tenna, Switzerland. It springs from a couple of the same name, presumably relatives, who lived nearly three hundred years ago, and during this period there have been bleeders among the male descendants. The females, as a rule, remain exempt, the disease being transmitted through them to their male children. Anton Hoessli (*Zeit. f. klin. Med.*, B. 15, H. 3, '88).

Case in a 12-year-old boy whose five brothers and sisters had died of hæmophilia. Fürth (*Inter. klin. Rund.*, Sept. 16, '88).

It is generally possible to demonstrate the hereditary character of this affection, which is the most hereditary of all disease. F. P. Henry (*Boston Med. and Surg. Jour.*, Mar. 14, '95).

Case of retinal hæmorrhage seen in a patient giving a family history of hæmophilia for four generations. The right eye, blind for eight years, showed the remains of an old hæmorrhage into the vitreous. In the left eye there was a small, recent hæmorrhage of the retina, with apparently miliary aneurisms on the retinal artery. Recovery of sight in the left eye was attained by absolute rest, milk diet, and the administration of iodide of potassium internally. Vialet (*Recueil d'Ophthal.*, June, '95).

History of a personal case of hæmophilia. Five of the children of the patient's great-grandmother died early, and none of the others, save one, now survives. Of these, three children out of the six known to patient's mother died young. This accords with the fact that a large percentage of the bleeders die early. Contrary to the usual statement, both the males and the females seem to have been bleeders, but only one (a male) died from the effects of hæmorrhages. The preponderance of the males is seen in two of the families named. This excess of sons over daughters has been given as a reason for the rarity of this disease.

The bleeding tendency in each instance was transmitted through the females. W. R. Steiner (*Johns Hopkins Hosp. Bull.*, Feb., 1900).

Among other etiological factors considered are a lack of fibrin or of fibrinogenous elements and neurasthenia bearing mainly upon the vasomotor constrictors.

Case of a girl of 16 years, in good health and with no marked history of hysteria, who began to bleed from the pulp of her fingers. This occurred without provocation and without rupture of the skin, and was not attended by any further symptoms, excepting despondency, almost amounting to melancholia. Yahoubian (*Gaz. Méd. d'Orient.*, Mar. 15, '91).

Case of a young woman who suffered from epistaxis, menorrhagia, metrorrhagia, hæmorrhagic diarrhœa, etc., always accompanied by great mental strain, fits of crying, fright, anger, and the like; at times, death seemed imminent. Anderson (*Med. and Surg. Rep.*, Mar. 28, '91).

Pathology.—The prevailing view is that hæmophilia is mainly due to a morbid condition of the vascular walls, and affecting especially the middle or muscular layer. According to Kuhlmann, the changes are such as to seriously compromise the anatomical and physiological functions. These changes are: Granu-

lation-necrosis occurring in tuberculosis, syphilis, leprosy, etc., and due to direct chemical changes between the physiological products of certain organisms and the protoplasm of the histological elements; amylosis occurring during extensive suppuration processes, and due to a similar direct change; coagulation-necrosis or mucoid degeneration occurring in cancerous and diphtheritic processes; liquefaction-necrosis occurring in typhus, variola, etc.; fatty and calcareous degeneration, in which the protoplasm is replaced by fatty granules and crystals of carbonate and phosphate of lime. The vasomotor system doubtless plays a part in the process.

It is possible that abnormal alkalinity of the blood may, by impairing the capacity of the blood for coagulation, assist in the production of hæmorrhages.

Prognosis.—Hæmophilia is particularly to be feared when it occurs in children in an aggravated form. In slight cases the disease frequently disappears at puberty. The hæmorrhages are usually more dangerous in boys than in girls; uterine hæmorrhages, though copious, seldom endanger life.

Treatment.—The treatment of hæmophilia mainly consists in the avoidance of exciting factors. The extraction of teeth should especially be guarded against and preference be given to measures, such as gradual loosening and evulsion with rubber, of a tooth, rather than to the forceps. Scratches, cuts, etc., should be avoided; hence an occupation exposing the sufferer to solutions of continuity becomes dangerous. Violent exercise is occasionally the only exciting factor.

Prophylactic treatment between attacks is also indicated. Of all the preparations, *hydrastis Canadensis* has proved most successful, when administered in

large doses, 10 to 15 drops of the fluid extract, three times a day.

The various preparations of iron have been recommended; ferratin is probably the most useful preparation at our disposal. The perchloride has been recommended by Legge. Strychnine is indicated on account of the involvement of the vasomotor system. Saline purgatives, by reducing the arterial tension, are valuable when prodromic symptoms are noticed.

Case of a woman who, because of hæmophilia, suffered from very excessive anæmia. She was treated by the various hæmostatics, and by repeated injections of ergotine, without much result. Finally 3 capsules of thyroid gland were given each day, with the result that the loss of blood was immediately arrested. The patient gained in weight, the purpuric spots disappeared, the gums became firm, and some color began to appear in the face. Cardiac palpitation was decreased. At no time was the dose greater than 3 capsules a day. *Delace* (*Jour. de Méd. de Paris*, Jan. 23, '98).

Case in which after trying the usual internal treatment by styptics without result, the writer ordered 5 grains of thyroid extract three times a day, all other medication being discontinued. At the end of a week the father stated that after the second dose all bleeding had stopped and that the boy had greatly improved. The drug was discontinued. At the end of the next week the boy had a fair color and greater strength than he had for a very long time. The urine was perfectly clear and normal, and had so remained for the two weeks since beginning the medication. *Eugene Fuller* (*Med. News*, Feb. 28, 1903).

In the treatment of hæmophilic hæmorrhage the recumbent position (except when the bleeding is at the nose) is of primary importance to reduce cardiac action. In women an alum plug inserted in the vagina, as recommended by *Beverly Cole*, is an efficient means. Lime-

juice internally and hypodermic injections of ergot should supplement the use of local styptics, the best of which are turpentine and perchloride of iron when these can be used. When the hæmorrhage is from the nasal cavities, the various measures recommended under EPISTAXIS are recommended. Transfusion sometimes becomes necessary, but it should be conducted with unusual care, owing to the morbid condition of the vascular walls. The best hæmostatic is the transfusion of entire blood, of which but a small quantity will sometimes stop an otherwise uncontrollable hæmorrhage. (Hayem.)

Case in a girl of 13, coming from a family of bleeders, and herself subject to severe attacks of epistaxis, menstruated for the first time in July, 1900, and who on December 6, 1900, had been flowing for two weeks, and *in extremis*. There was marked pallor and weakness, the respiration was sighing; temperature, 102° F. (38.8° C.); pulse, 150. Salt solution injections and packing with ferric subsulphate, which had to be repeated three times because of leaking, were of no avail. On December 8th she was delirious, and death was expected. As a last resort a half pint of 1-per-cent. solution of sterilized gelatin was injected under the breast during the morning and again in the afternoon. The hæmorrhage ceased, and the patient recovered. C. H. Hare (Boston Med. and Surg. Jour., July 18, 1901).

Case of a male Hindoo Brahmin bleeder thirty-two years of age, who presented the usual signs of partial exsanguination. The uvula was tremendously engorged $2\frac{1}{2}$ inches in length and bleeding freely. The engorged organ was seized with the forceps and cut off. The patient died six days later from intestinal hæmorrhage. A hypodermic injection wound was immediately controlled by the use of adrenalin, and the hæmorrhage from the wound in the pharynx, which because of the nature of the lesion was large, was also entirely stopped by adrenalin. Er-

nest Francis (Brit. Med. Jour., May 28, 1904).

HÆMORRHOIDS.—Gr., from *αἷμα*, blood, and *ὄρροίς*, pertaining to.

Definition.—A vascular tumor of the mucous membrane of the rectum, the anus, or both.

Varieties.—Hæmorrhoids may be classified into two varieties: external and internal.

They are called *external* when the skin alone is involved, and the tumor is external to the external sphincter muscle, while the internal are covered by the mucous membrane. It often happens, in long-standing cases, that internal piles protrude outside the anus, yet, when they are returned into the bowel, they will remain for a short time, at least; but the external cannot be pushed up into the bowel. Should only a portion be returned while the other remained on the outside, it might properly be termed a *combination* pile.

When there is any protrusion around the rectum, or swelling, it is necessary to ascertain when this protrusion appears, whether it is always present, or whether it only occurs at stool; whether it is brought on by long, hard straining or by a very slight exertion. We should also know whether it disappears spontaneously, or whether the patient has to restore it; and, if so, whether such restoration is easy or difficult. If at the time of examination the protrusion is down, one should observe the direction of the rugæ, whether circular or running up and down; also the condition of the mucous membrane of the parts, whether it is healthy, excoriated, or ulcerated; whether such protrusion is regular or irregular, and whether it is attached by sessile or peduncular base. No diagnosis of a rectal condition is ever complete or reliable until both digital and ocular examinations have verified the opinion gained from the subjective history and questioning.

In preparing a patient for a first rectal examination, personally an enema is not given until after the finger and speculum have been introduced to learn the habitual condition of the parts. Having learned this, then a rectal irrigation, or salt and soap-sud enema should be given the patient, and the bowels moved. This will be advantageous for two purposes: first, the cleansing of the parts, and, secondly, the bringing down of any protrusion which ordinarily occurs at the time of the patient's going to stool. The commode or toilet to which the patient retires should be in close proximity to the doctor's office, in order that he can see such protrusion before it retires spontaneously; and, if there be a bleeding protrusion, to avoid any unusual delay in examination and unnecessary soiling of the patient's clothes. J. P. Tuttle (*International Jour. of Surg.*, Jan., 1901).

Symptoms and Diagnosis.—There is usually a sense of fullness and heat, throbbing pain, tight sphincter, with irresistible tendency to strain, and sometimes an itching sensation. When inflammation is present to any degree, the patient will be uncomfortable in any position he may assume, and may also have a slight elevation of temperature.

The following are the diseases which resemble hæmorrhoids most: 1. Polypi. 2. Villous tumors. 3. Malignant growths. 4. Prolapsus. 5. Pruritus ani. 6. Hæmorrhages.

Polypi can be differentiated from hæmorrhoids by their soft, smooth, elastic feel, pyriform shape, and long, slender pedicle.

Villous tumors by their broad base, slow growth, spongy feel, dark-red color, and frequent hæmorrhages.

Malignant growths in the early stage present a number of hard nodules on the side of the rectal wall; at a later date they become larger and break down, after which the diagnosis is made without difficulty.

Prolapsus involves the entire circumference of the bowel. The tumor is cone-shaped, with a slit in the centre, and has a velvet-like appearance, while piles are distinct tumors.

Pruritus ani is frequently called itching piles. This is not warranted, since there is an absence of both tumors and hæmorrhage, while the itching is caused, in a large percentage of cases, from some irritating discharge from the rectum, thread-worms, neuroses, or eczema of the skin. Hæmorrhages of all kinds from the rectum are usually attributed to piles, but may be due to ulceration, injury, fissure, and malignant growths.

Etiology.—Neither sex nor station in life is a bar against the production of hæmorrhoids. The erect position man occupies is, from gravity alone, conducive to them. The rectum is abundantly supplied with veins, which enter into the formation of the hæmorrhoidal plexus. A portion of this blood is returned through the internal iliac to the inferior cava, the remainder by way of the inferior mesenteric to the liver; and these veins, like others of the portal system, have no valves. The branches of the superior hæmorrhoidal veins in their journey upward pass through little slits in the muscular wall, and therein, Verneuil claims, is to be found the principal cause of this disease. He believes that the dilatation is due to the obstruction of the calibre of the veins from the muscle contracting on them as they pass through it. While this anatomical fact undoubtedly tends to dilatation under certain conditions, it does not seem to be sufficient of itself to account for the enlargement of the veins in all cases. It is well known that the rectal and anal plexuses have no valves, and, further, that, when a patient afflicted with prolapsed piles is requested to strain down,

they at once become engorged with venous blood as a direct result of the pressure of the abdominal muscles. It is not at all unreasonable, then, to suppose that the pressure from the above muscles on the blood-column or the pressure from a pregnant uterus of some growth might be productive of hæmorrhoids by interfering with venous circulation. Some of the common causes of this disease are morbid growths of liver, spleen, uterus, ovaries, and prostate by causing venous obstruction.

Hæmorrhoids and painful fissure are often associated with uterine disease, either inflammatory in nature or due to the pressure of tumors. Murray (*Archives of Gynec.*, June, '91).

Local causes are always responsible for the development of hæmorrhoids. Among local causes those which prevent the return-circulation through the portal system and vena cava are most important. Rectal and perirectal tumors, the pregnant uterus, tumors of the large intestine, disease of the adnexa, stones in the bladder, intestinal ulcerations, stenosis, catarrh, etc., may give rise to hæmorrhoids. The most important and benign causes are those which are due to the pressure of hard and stagnated fæces upon the rectal ampullæ or sigmoid flexure. When hæmorrhoids develop with normal defecation, there is present a certain hypoplasia of the venous plexus, perhaps also an atrophy of the rectal mucous membrane itself. In cases with diarrhoea there exists, as a rule, a more deeply situated catarrh of the large intestine or rectum under whose influence an increased congestion of the hæmorrhoidal plexus might occur. J. Boas (*Deutsche medizinisch-Zeit.*, Oct. 30, '99).

Constipation, stone in the bladder, urethral obstruction, and purgatives are also conducive to piles from the intense straining which they induce. Congestion of the liver, obstructive diseases of the heart, improper diet, alcoholism, and irregular habits, as well as inherited pre-

disposition, may all be said to be etiological factors.

Many railway-employees suffer from hæmorrhoids as a result of irregularities in living, combined with the jarring motion of the train.

The cutaneous variety of external pile is classified as redundant, hyperplastic, or hypertrophic. The distinctive feature of the redundant pile is the superabundance of the anal integument brought about by the stretching it receives from the subjacent varicose external hæmorrhoidal veins when they are fully distended, as during defecation. The hyperplastic pile appears in the form of a pendulous cutaneous tag, associated with an abrasion, fissure, or ulceration of the anal verge, and is the result of an inflammatory hyperplasia; while the term hypertrophic indicates that the swelled, thickened, radiating anal folds associated with the eczematous inflammation are the result of an inflammatory or irritative hypertrophy. J. Walter Otis (*Amer. Jour. Med. Sci.*, Feb., '95).

The causes of hæmorrhoids are: 1. Diminution of the forces that normally move the venous blood from the rectum to the heart. 2. Obstruction of the venous outflow from the rectum. 3. Predisposition.

From these views of the etiology of hæmorrhoids may be easily deduced the principles of prophylaxis. Wallace A. Briggs (*Occidental Med. Times*, Dec., '95).

Hæmorrhoids consist essentially in the new formation of young blood-vessels by a process of germination from the older vessel-walls and the consequent formation of a cavernous tissue. Inflammatory changes, such as thrombosis and endophlebitis, may also occur within the neoplasm, but are absent in the majority of cases. Venous stasis has nothing to do with hæmorrhoids, being at most a secondary phenomenon. George Reinbach (*Beitrag zur klin. Chirurgie*, vol. xix, No. 1, '97).

External Hæmorrhoids.

External piles are so common that few persons arrive at middle age without hav-

ing suffered from them. They are classified into thrombotic and cutaneous varieties.

Thrombotic or venous piles consist of elevations of skin near the anal margin, oval in form and of a livid color or slightly tinged with blue, filled with a hard clot of blood inclosed in a sac. The amount of pain depends upon the inflammation. Usually it becomes severe and will continue until the clot is turned out or suppuration takes place. These tumors form quickly, and present themselves during the act of defecation, following an attack of constipation, necessitating great straining. They have the appearance and feeling similar to that of a bullet beneath the skin, and are generally single. They are caused by excessive eating, irregular habits, and anything that is conducive to constipation.

Unless external hæmorrhoids become irritated or inflamed they will cause little inconvenience; in fact, many persons go through life with them and suffer very little. When the parts are not properly attended, they frequently become acutely inflamed and cause much pain and annoyance until they are removed.

Treatment of External Hæmorrhoids.

—The treatment of external piles may be *palliative* or *operative*. The latter is always to be preferred unless the patient refuses to submit to a trivial operation. In such a case much relief is to be had from the use of certain palliative measures.

PALLIATIVE TREATMENT.—In all cases attention should be paid to the diet. The use of highly-seasoned food and stimulants, such as tobacco, whisky, wines, and beer, should be discontinued, and a simple diet substituted. The bowels should be kept open by the use of Vichy, Hunyadi, Freidrichshall, or some other mineral water. If there are symptoms

of a congested liver, a few calomel particles, $\frac{1}{10}$ grain, or the blue pill properly administered will prove beneficial. Frequent hot baths should be taken, and the anus washed with Castile soap and water. If the pile belong to the first variety, containing a hard clot, frequent applications of an ointment composed of

℞ Morphine sulphate, 6 grains.

Calomel, 12 grains.

Vaseline, 1 ounce.

will soothe the parts and reduce the inflammation. The old-time lead-and-opium wash, either hot or cold, applied constantly, affords great relief:—

℞ Lead-water, 4 drachms.

Tincture of opium, $2\frac{1}{2}$ drachms.

Distilled water, enough to make 4 ounces.—M.

The lead solution mixed with the sugar of milk forms a very soothing application. Hot poultices of any kind, if applied constantly, will prove valuable in relieving pain and reducing inflammation in either variety.

In the medical treatment of hæmorrhoids daily action of the bowels should be obtained. Sponging the anus and surrounding parts with soap and cold water is a very efficient application. Less meat and more vegetable food is to be eaten and physical exercise taken daily. Injections beginning with lukewarm water and gradually changing to cold often afford great relief. Those who suffer from hæmorrhoids should, if possible, give up taking stimulants entirely. Thomas (Lancet, Jan. 31, '91).

Tar warmly recommended in the treatment of hæmorrhoids. The following ointment may be used:—

℞ Tar,

Extract of belladonna, of each, 46 minims.

Glycerin, 1 fluidounce.

M. Sig.: To be applied locally morning and evening. Lacruz (Revista de Med. y Cirujica Practicas, Apr. 7, '94).

The pain and irritation accompanying inflamed hæmorrhoids may be quickly relieved by local washing with a weak solution of bichloride,—about 6 ounces of a 1 to 10,000 solution. Immediately after this the patient should introduce a tampon of cotton impregnated with the following ointment:—

R Lanolin, 1½ ounces.

Vaseline, 5 drachms.

Distilled water, 1 fluidounce.

M. Sig.: For external use.

These applications should be made a number of times each day. Illinsky (*Revue Internat. de Méd. et de Chir.*, Dec., '94).

Following ointment employed in the treatment of hæmorrhoids: 2 ounces of camphor-lanolin; 3 drachms of castor-oil; 1½ drachms of precipitated chalk; 30 grains of hydrobromate of cicutin. Monin (*Méd. Mod.*, Nov. 4, '96).

External piles and anal pruritus treated by the application of collodion. This causes the pile to contract and supports the contracted pile. The collodion is applied on a little cotton-wool each morning after defecation. D. W. S. Samways (*Brit. Med. Jour.*, Nov. 21, '96).

Calomel is curative and prevents the phlebitis which causes suffering. For external hæmorrhoids, laxatives are given and the tumors powdered with calomel; for internal hæmorrhoids, calomel suppositories or an ointment composed as follows should be used:—

R Calomel, 30 grains.

Vaseline,

Lanolin, of each, ½ ounce.

Belladonna or opium may be added if desired. The anus should be washed with boric-acid water after each defecation. (*Jour. de Méd. de Bordeaux*, Sept. 23, 1900.)

Just as one raises an inflamed limb in surgical practice to diminish the intravenous pressure, so can the pressure in the hæmorrhoidal veins be lessened by raising the buttocks, until the anus (and thus the plexus) occupy a higher position than the inferior vena cava and heart. Such marked relief of distressing

symptoms personally obtained by adopting this principle that it suggested a method of procedure which gives very satisfactory results in practice. Two wedge-shaped pillows or bolsters are placed with their bases toward the foot-end, about 20 inches from the head-end of the bed. The two wedges lie on top of one another, producing an elevation of some 16 to 18 inches. The patient lies with his buttocks at the highest point of the wedges, on his back, but he finds that the body-weight reduces the elevation by some 10 inches. The head must be placed against the head-end of the bedstead. Practical experience has shown that the position is a comfortable one. It may, however, be varied by a half abdominal and half right-sided position; the left leg can then be flexed and the knee brought up on to the wedges. In ordinary cases it is sufficient to employ this position merely at night-time. The cases react well if repeated for two or three nights. In severe cases it is necessary to keep the patient in bed in this position for some days. At the same time local applications can be resorted to. Of course, this treatment will not do away with surgical procedure, but the patient can usually be kept quite free from distressing symptoms by this means. G. Oeder (*Brit. Med. Jour.*, from *Zeitsch. f. diät. u. physik. Therap.*, No. 8, 1901).

OPERATIVE TREATMENT.—In the thrombotic variety the tumors should each be incised, the clot turned out, and some escharotic or packing applied to the inside of the pile to insure the closing of any rent in the vein. The patient should then be placed in bed to remain there for several hours to prevent the tumors filling up again.

The surgical treatment of the cutaneous variety differs somewhat from the one just referred to, in that the tumor is seized with a pair of catch-tooth forceps and then snipped off with a pair of curved scissors, care being exercised not to remove any more of the skin than is

absolutely necessary, lest too much contraction follow the operation. When there is considerable space between the edge of the skin and the mucous membrane, it is best to unite them by catgut sutures. If the sphincter has been previously divulsed, little pain will follow the operation. When there is only one tumor and that small, it can be removed with comparatively little pain after an injection into it of a 6-per-cent. solution of cocaine. It does not make any difference, from an operative point of view, whether the pile is inflamed or not; it should be operated upon just as soon as the patient's consent is obtained.

Cases of stricture from operations for extreme hæmorrhoids have been reported, but they are rare and follow only where an *excessive* raw surface is left after removal of swelled tumors.

Cutaneous Hæmorrhoid, or Hypertrophied Skin.—This variety consists of hypertrophied prolongations of the skin. Cutaneous piles are frequently a result of the other variety, a fold of skin being left after the clot has been out-turned or absorbed. They may be single or multiple, but usually retain the natural color of the skin, which has become thickened. They are much aggravated by improper diet, irregular habits, and uncleanness.

Internal Hæmorrhoids.

Internal hæmorrhoids are developed, in many respects, like the external variety, and the causes which produce the one may also produce the other. In cases of long standing they remain outside the anus nearly all the time and frequently become ulcerated, causing much pain and bleeding. It is not uncommon to see both external and internal piles present at the same time, thus necessitating a combination operation to insure a good result. The internal variety is due to certain changes which take place in the

blood-vessels in and beneath the mucous membrane.

Symptoms.—Some patients have internal piles for years and suffer very little annoyance from them, while others suffer greatly from the first. Frequently strong men and women become emaciated and nervous from an apparently simple case,—so much so that they are totally unable to attend to their ordinary duties. The most prominent symptom of this variety of piles is the bleeding, and from this fact they are frequently referred to as “bleeding-piles.” The bleeding is usually preceded by the protrusion of the tumors during the act of defecation, and may be slight or profuse. Sometimes the hæmorrhages are sufficient to induce fainting. When the piles are not inflamed, the only inconvenience is a sensation of heat and fullness; but when they become swelled or strangulated and the inflammation becomes active, the sphincter alternately contracts and relaxes on them, thus producing most excruciating pain, which lasts until they slough off, have been operated on, or are relieved by palliative remedies. In cases of long-standing, the walls of the piles become tough and hypertrophied. The bleeding, in the vast majority of cases, is of a venous character.

Cripps believes that the spurting, in cases which appear to be arterial, is due to the blood being forced as a regurgitant stream through a rupture in the vein by the powerful abdominal muscles. In some instances, however, others have witnessed hæmorrhages wherein the blood presented the appearance of that coming from an arterial twig.

Internal hæmorrhoids may be divided into two classes, viz.: capillary and venous.

CAPILLARY.—The capillary tumors

are rare, smaller than the venous, spongy in texture, are formed by the *superficial vessels* of the mucous membrane, and resemble strawberries. They may appear alone or be present with the venous variety. They rarely protrude and scarcely ever give pain, but always bleed profusely.

VENOUS.—This variety is of more frequent occurrence than the capillary; the tumors are large and vary in size from one-half to one inch across their bases, are covered by mucous membrane, having a glistening appearance, are a bluish or livid color, and are formed as a result of a dilatation of the veins in the mucous and submucous tissues.

Treatment of Internal Hæmorrhoids.

— **PALLIATIVE.**—Palliative measures afford relief in many cases, while in a few they may reduce the piles altogether. When these are small and cause but little suffering, the treatment is simple. In the first place, errors in diet and habits of living should be corrected. When piles are protruded and inflamed the patient should assume the recumbent position and keep perfectly quiet, and soothing or astringent lotions and ointments should be applied constantly. When these fail relief can often be had from ice and poultices made of flaxseed, corn-meal, and onions. The symptoms of a congested liver should at once be counteracted.

When piles are not large or strangulated they can be made to contract by the application of pure nitric acid. The tumors must be returned above the sphincter at the earliest opportunity. If the patient must work he may get some comfort from a pile-supporter. The bowels should be kept open at all times and the patient instructed to cultivate regular habits as to the time his bowels should be moved.

For internal hæmorrhoids excellent results obtained from tincture ferri perchloridi and hazelin, 20 drops of each in an ounce of water internally, twice daily, and injections *per anum* of tincture ferri perchloridi, 4 drachms, and hazelin, 4 drachms. The injection is best given at bed-time, so that it may be retained. N. C. Mitra (New Orleans Med. and Surg. Jour., Nov., '95).

Calomel in the form of a suppository is very beneficial in hæmorrhage due to piles. In a series of cases, mostly of old standing, the results were highly satisfactory. It immediately arrests the bleeding, lessens the frequency and chances of its occurrence, and greatly reduces the size of the hæmorrhoids. Not more than from 12 to 15 suppositories were used in a single case, 1 suppository being introduced daily into the rectum, and left there for twelve or twenty-four hours, according as the condition of the case demanded. J. Klewtzow (Vratch, Feb. 25, '99).

A bland diet, especially sweet milk, is absolutely injurious on account of the lack of stimulation of the peristalsis. Great care should be paid to the toilet of the anal region after defecation, a solution of tannin or alum on a cotton wad being used. An ascending douche is of value. In giving enemata, a soft sound should be used, and all irritating substances like glycerin, salt, etc., should be avoided. Except in extreme cases, purgatives should not be given. To control hæmorrhage, which occurs even when the fæces are normal, a teaspoonful of fluid extract of hamamelis Virginica in a wineglassful of water three times a day for four weeks, then twice a day for a month, and then once a day for another month, is to be recommended. If the hæmorrhage is severe, a powerful dose of opium should be given and the bleeding spot tamponed with gauze. After it has been arrested for three days a dose of castor-oil is to be taken. I. Boas and F. Karewsky (Ther. der Gegenwart, Nov., '99).

For local use against pain and excoriation, the following suppository is recommended:—

R. Chrysarobin, $1\frac{1}{2}$ grains.
 Iodoform, $\frac{80}{100}$ grain.
 Extract of belladonna, $\frac{15}{100}$ grain.
 Cacao-butter, 30 grains.

M. For one suppository. Two or three may be used daily. Boas (Centrab. f. Ther., Dec., '99).

Under the influence of the adrenalin the congestion diminishes, the hæmorrhage stops, the pain ceases, the tumors become reducible. In cases of internal hæmorrhoids an ointment of cocaine hydrochlorate, $\frac{1}{20}$ grain; adrenalin, 30 drops; vaselin, $\frac{1}{2}$ ounce, is efficacious. M. Demay de Certant (Jour. de Méd. de Bordeaux, No. 20, 1904).

SURGICAL TREATMENT.—Operations when properly performed always effect a permanent cure, and in a shorter time than is required for even temporary relief by palliative measures; the suffering is much less when there are no complications. The operation is a trivial one, insuring complete cure; it should be recommended, and performed at once, regardless of any inflammation.

When an operation is necessary, that best suited for the case under advisement should be selected, no single operation being adaptable to all cases.

The general health of the patient should be looked into, and improved, if need be, by appropriate measures. The urine should be carefully examined to detect the presence of any kidney complication. On the morning preceding the operation 2 teaspoonfuls of compound licorice-powder should be given, and one hour previous to the same the surrounding parts should be cleansed, shaved, if necessary, and the rectum thoroughly washed out.

OPERATIONS.—Many operations, more or less valuable, have been devised for the relief of hæmorrhoids. Dilatation of the sphincter has met with some success by French surgeons, who originated it.

Dilatation of the anus. In the first stage of hæmorrhoids—that of inter-

mittence, where the attacks occur but three or four times a year and are accompanied by a slight burning sensation and pruritus of the anus, with a small flow of blood—gentle purgatives are ordered, applications of very warm water, enemata at the same temperature, and applications of plugs of cotton steeped in a 1-per-cent. solution of cocaine. In the second stage, where the piles are procident and the rectal varicose veins are very painful, forcible dilatation gives unvarying success. Before employing the speculum, local anæsthesia of the parts is produced in the following manner: The patient being placed in the classical position on the side, with one leg extended, the other bent on the thigh and on the abdomen, an assistant exposes the anal region. The operator takes in a forceps a small plug of cotton, steeped in a 1-per-cent. solution of cocaine, and passes it into the rectum as high up as possible; this plug is followed by another a little larger, and yet a third and a fourth, increasing in size until he can insert one as large as a walnut. He then takes an ordinary Pravaz syringe filled with the same solution and inserts the needle into the perineum, half an inch from the anus, and injects slowly the contents, taking care to turn the needle in different directions, and by this means one-fourth of the circle limiting the rectal orifice is anæsthetized. The injection is renewed in the second quarter, and so on until the circle is completed, each syringe containing $\frac{1}{4}$ grain; it is thus that 1 grain of cocaine has been injected. But in order that the dilating process should be painless the sphincter must be anæsthetized, and for this purpose the operator passes the index finger of the left hand into the rectum and plunges the needle through the skin up to the muscle, guiding it with the finger; he empties half of the syringe at that point and the remainder as he is withdrawing it.

Twenty-six patients operated upon in this way without any accident. In the third stage, where the veins form a turgescient mass, they should be removed with the bistoury, without dissection of

the mucous membrane. Paul Réclus (La Semaine Méd., Nov. 28, '94).

Experience has shown, however, that dilatation offers only temporary relief. The crushing method of Mr. Herbert Allingham is occasionally used in England, but rarely in this country.

And it may be said that of all the operations proposed, but four operations are entitled to consideration. They are: the injection, Whitehead's, ligature, and clamp and cautery.

Injection.—A few years ago the treatment of piles by this method was quite in vogue, but specialists have practically discarded it. Experience has shown that the results are not permanent and that annoying complications frequently arise. This method is attractive to the laity because no knife is used; it is sometimes painless, and does not detain them from their business. This is true when a perfect result is obtained. On the other hand, when extensive inflammation and sloughing occurs they will suffer more pain and be detained longer than if a better and more radical operation had been made. It certainly is not the best operation for the average case of piles and is suited only for the *small, distinct, pendulous* piles situated above the grasp of the sphincter-muscle that bleed freely.

Piles should not be injected when inflamed, strangulated, large and hypertrophied, or external. When they are injected promiscuously the treatment will frequently be followed by great pain, swelling, sloughing, abscess, fistula, phlebitis, pyæmia, long delay from business, partial cure, and occasionally death. When used in selected cases, however, a cure is obtained quickly with little pain. The preparations are the same as for any other rectal operation. It is well to warn patients when they have several tumors that two or three treatments may

be necessary to effect a complete cure. An ordinary hypodermic syringe and a small speculum are the only instruments required. To avoid accidents it is well to observe the following rules:—

1. Cleanse the anus and surrounding parts.

2. Place the syringe and needle in boiling water until everything is in readiness.

3. Accurately gauge the amount to be injected.

4. Force the air out before introducing the needle.

5. Inject the fluid slowly in the *pendulous* portion.

6. Inject from 2 to 5 drops in small and 5 to 10 in large piles.

7. Leave the needle within until the pile turns white.

8. Do not inject the tissue beneath the pile.

9. As the needle is withdrawn make pressure with the index finger to prevent the escape of the fluid and arrest hæmorrhage.

10. Promptly return all tumors.

11. Make a fresh solution for each injection.

12. Keep the patient in the recumbent position one-half hour after the operation.

13. Only a fluid or semisolid diet should be permitted for a few days.

14. Weak in preference to strong solution should be employed.

15. Inject only one or two piles at a sitting.

As to the solutions to be injected, almost all the caustics in the vegetable and mineral kingdoms have been tried, with varying success. The most successful results have been obtained, however, from carbolic acid in combination with glycerin, alcohol, olive-oil, and water. Experience has shown that the weaker

solutions cause fewer complications and give better results than the stronger. The following formula is very satisfactory:—

℞ Carbolic acid, 12 grains.
Glycerin, 1 drachm.
Water, 1 drachm.—M.

Iodine, iron, ergot, and ergotine have been extensively used, but have no advantages over carbolic acid.

An ordinary case of hæmorrhoids can be cured by injection and the patient still be able to work. It is an error to use oil in any injection. The author uses for a single syringe-ful

℞ Acid. carbolic., 2 to 5 drops.
Alcohol (pure), 10 to 20 drops.
Distilled water, enough to make 1 drachm.—M.

Two to 3 minims to be injected alongside each pile as the needle is withdrawn. The syringe and rectum should be clean and not more than three hæmorrhoids injected at once.

One must be careful not to enter the vessel with the needle. If a man is at work, one hæmorrhoid at a time should be treated every four or five days. Carter Cole (*The Post-graduate*, Nov., '95).

By injecting carbolic acid into the piles a sure cure may be obtained without any risk or fear of consequences. All that is required is to adhere to certain rules laid down by experience, as: Never inject inflamed or irritated piles; never employ a speculum; inject the smaller piles first; handle the parts with great gentleness; apply vaselin to protect the parts from overflow of fluid; do not operate a second time until all soreness disappears.

The mode of procedure is to insert the needle at or near the apex of the pile, and inject slowly, drop by drop, until the tumor changes color. Then remove excess of fluid with glycerin or Monsel's solution on cotton held over the opening. If blood follows, not enough has been injected, and the procedure must be repeated immediately. As much as a drachm may be used for one injection. Pain will be relieved by hot

water. No sloughing, swelling, or abscess will follow this little operation.

The solutions used are of varying composition:—

Carbolic acid, 1 ounce.
Zinc chloride, 8 grains.
Olive-oil, 5 ounces.
Carbolic acid, 2 drachms.
Glycerin, 2 drachms.
Fluid extract of ergot, 1 drachm.
Water, 2 drachms.
Carbolic acid, 12 grains.
Glycerin, 1 drachm.
Water, 1 drachm.
Carbolic acid, 30 grains.
Extract of witch-hazel, 6 drachms.
Distilled water, 6 drachms.

Henry M. Woolman (*Med. Council*, Dec., 1901).

Hot decinormal salt solution injections used in internal hæmorrhoids. The solution is injected as hot as can be borne by the hand, inserting the needle as near the base of the tumor as possible. The needle is thrust to about the middle point. Ten minims of the solution are first injected, the needle pulled out about a sixteenth of an inch, an equal quantity of the solution injected and the balance (to one drachm or even 2 drachms) placed just beneath the mucous surface which almost immediately turns a pink-red color, in two minutes becoming blanched. After a few applications the hæmorrhoids slough away. The procedure is almost painless. L. Lofton (*Med. Record*, Mar. 14, 1903).

Calcium chloride injections for internal piles in which hæmorrhage is the chief symptom recommended from an experience of twenty-five cases so treated. The technique of the injection is very simple. A 10 per cent. watery solution of calcium chloride is made and after the bowel has been emptied 20 grammes are injected and retained by the patient. In very severe cases a second injection just before bedtime may be given. No pain or discomfort arises from the treatment and the results are most satisfactory, though the piles are not cured. J. Boas (*Die Therapie der Gegenwart*, p. 295, 1904).

Whitehead's Operation.—Mr. Whitehead describes his operation as follows: "By the aid of scissors and a pair of dissecting forceps the mucous membrane is divided at its junction with the skin around the entire circumference of the bowel, every irregularity of the skin being carefully followed. The external and the internal sphincters are then exposed by rapid dissection and the mucous membrane and the attached hæmorrhoids, thus separated from the submucous bed upon which they rested, are pulled bodily down, any undivided points of resistance being snipped and the hæmorrhoids brought below the margin of the skin." The mucous membrane above the hæmorrhoids is now divided transversely in *successive stages* and the free margin of the severed membrane above is attached, as soon as divided, to the free margin of the skin below by a suitable number of silk sutures, which he does not remove. He prefers the lithotomy position and uses torsion to arrest hæmorrhage in preference to the ligature. Mr. Whitehead claims that piles are not individual tumors, but that they are only a part of the general plexus of the veins associated with the superior hæmorrhoidal, each radicle being similarly, if not equally, affected by the initial cause, either constitutional or mechanical. He believes that all vessels should be exposed, and that the entire pile-bearing area should be removed. The operation has not become general either in this country or in England; in fact, few, if any, perform it either in an ordinary or a severe case.

The operation under consideration certainly deserves a place in rectal surgery, but not so prominent a one as Mr. Whitehead grants it. It is not suited for the treatment of *ordinary* or even *severe*

cases, for two reasons: first, they can be cured by a less difficult operation; second, complications frequently accompany and undesirable results may follow the operation. The operation is indicated in long-standing cases, accompanied by frequent hæmorrhages, where there are no distinct pile-tumors, but where the veins of the entire rectal wall are engorged and extensively dilated from the external sphincter upward for two or three inches. When such a condition is present nothing short of the removal of the entire disease area will effect a cure.

It is necessary to emphasize the danger of stricture following this operation; I have had 15 such cases come under my care within the past five years. Persons thus mutilated not only suffer from the constriction and ulceration, but in addition from an unbearable pruritus that is being irritated constantly by the discharge. All these untoward conditions are the result of non-union and retraction of the mucous membrane.

Whitehead's operation (complete resection) considered rather formidable, with loss of time, considerable hæmorrhage, and danger of sepsis; Allingham's (ablation and ligation) excellent in most cases, but takes longer, involves a greater loss of blood, and is followed by more post-operative pain than the clamp and cautery. In recommending the latter the necessity of stretching the sphincter, applying the clamp in the long axis of the bowel, and using the cautery at a dull-red heat emphasized. Parker Syme (N. Y. Med. Jour., Feb. 12, '98).

The method of excision as practiced at the Mikulicz clinic is productive of the best results. In the important points it is identical with Whitehead's operation. The preliminary preparation consists in the administration of castor-oil

three days before operation, and restricted diet. On the evening before and on the morning of the day set for operation rectal irrigations with boric-acid solutions are given, followed by tinctura opii, 10 to 15 drops. The lower third of the rectum is covered with a paste made of iodoform, and 3-per-cent. carbolic solution. The technique differs from Whitehead's as follows: The sphincter is not stretched to the point of paralysis, the anus is merely dilated enough to bring the hæmorrhoids into plain view. Hemostasis is solely accomplished by suture. No ligatures are used. The suture is made with catgut instead of silk. Blood is removed during the operation by a continuous irrigation with cold boric-acid solution. The use of sponges is interdicted. The line of suture is dressed with a paste of iodoform spread on gauze. The bowels are moved for the first time on the tenth day, being kept costive by the administration of opiates. Phlebitis, thrombosis, and ulceration contra-indicate this operation. Eighty-one cases thus operated upon from one to five years ago, have been followed with no recurrence. Reinbach (*Beiträge zur klin. Chir.*, B. 23, H. 3).

Operation for hæmorrhoids to prevent the loss of mucous membrane that occurs after most of them, and avoid contraction of the cicatrix. Opposite the base of the hæmorrhoid, parallel with the muco-cutaneous junction, a curved incision is made, and is carried upward on the same plane as Whitehead's operation. A second curved incision is made, forming an eclipse at the poles, of which an incision is carried upward, giving two rectangular flaps of mucous membrane; the hæmorrhoidal mass is then ligated with catgut and removed, the flaps are then stitched, with a small piece of the catgut ligature left protruding to act as a drain. E. Eliot, Jr. (*Med. News*, Dec. 1, 1900).

Radical cure of hæmorrhoids without the use of general anæsthesia. The Kelly sphincteroscope is introduced. A pledget of cotton an inch or so in length, moistened with a 4-per-cent. cocaine solution, is introduced and the speculum withdrawn. The speculum is, after a few

minutes, reintroduced, the cotton removed, the hæmorrhoid brought into view, and superficially seared or punctured by a small electrocautery knife. Some of the cotton is permitted to remain. After a week or so a second hæmorrhoid is treated, and so on until a complete cure results. Davis (*Annals of Surgery*, June, 1902).

Ligature is pre-eminently the best for ordinary cases of piles, with one exception, namely: the clamp and cautery. The results that have followed both have proved that they are deserving of the highest praise and a detailed consideration. The reader may choose the one he can perform with the most satisfactory results, with the assurance that a radical cure will be effected.

Surgeons differ as to the best method of applying the ligature. The majority, however, prefer the operation which was devised by the late Mr. Salmond and popularized by Allingham, Sr.

The patient, having been previously prepared by purgation, is placed on the right side of a hard couch in a good light and is completely anæsthetized. The sphincter-muscle is then completely, but gently, dilated. This completed, the rectum for three inches is within easy reach, and no contraction of the sphincter takes place; so that all is clear like a map. The hæmorrhoids, one by one, are taken by the surgeon with a vulsellum, catch-tooth, or Pratt's "T" forceps, and drawn down. He then, with a pair of sharp scissors, separates the pile from its connection with the muscular and sub-mucous tissues upon which it rests. The cut is to be made in the sulcus, or white mark, which is seen where the skin meets the mucous membrane, and this incision is to be carried up the bowel and parallel to it to such a distance that the pile is left connected by an isthmus of vessels and mucous membrane only. There is

no danger in making this incision, because all the larger vessels come from above, running parallel with the bowel, just *beneath* the mucous membrane, and thus enter the upper part of the pile. A well-waxed, strong, thin, plaited silk ligature (Turner's, No. 8) is now to be placed at the bottom of the deep groove made, and the assistant then draws the pile well out. The ligature is tied high up at the neck (see Fig. 1) of the tumor

do not assist in the formation of the pile, being outside it. The silk should be so strong that the operator cannot break it by fair pulling. If the pile is very large, a small portion may now be cut off, taking good care to leave sufficient stump beyond the ligature to guard against its slipping. When all the hæmorrhoids are thus tied they should be returned within the sphincter. After this is done any superabundant skin which remains ap-

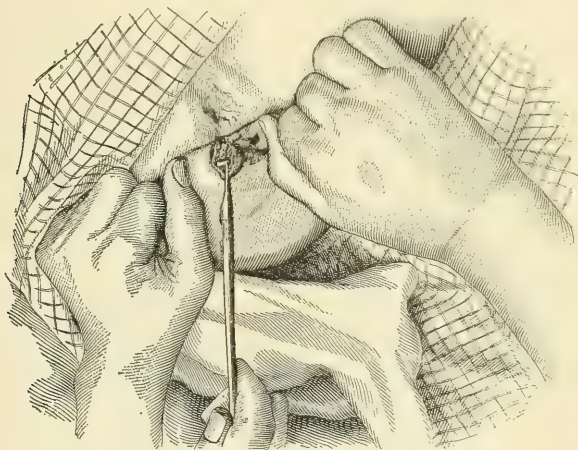


Fig. 1.—Correct method of applying the ligature. (*Gant.*)

as tightly as possible. Great care must be exercised in tying the ligature. The operator should be equally careful to tie the second knot so that no slipping or giving way can take place. If it is advisable, tie a third knot, for the secret of the well-being of the patient depends greatly upon this tying,—a part of the operation by no means easy to effect. If this is done, all the large vessels in the piles must be included. The arteries in the cellular tissues around and outside the lower bowel are few and *small*, and

parent may be cut off; but it should not be too freely excised, for fear of contraction when the wound heals. A pad of gauze is then placed over the anus; this is covered with a tight T-bandage, as it relieves pain most materially and prevents any tendency to straining.

To secure a cure by the ligature it is not essential to follow in detail the various steps as just recorded. The lithotomy position, with the limbs well flexed on the abdomen and held in position by Clover's crutch, presents a better view

of the parts after the sphincter has been divulsed. Sitting upon a high stool in front of the patient, the operator has the free use of his hands and can apply the ligature with more ease and in a shorter time than when the patient is placed on the side. After all of the piles have been ligated and those portions external to the ligature cut off, the stump should be placed within the bowel.

Patients suffer considerably for the first twenty-four hours because the sensitive nerves have been included in the ligatures. The pain during the second and third days is frequently quite annoying, though in some cases it will be very slight. The lower part of the rectum presents a sensation of heat and fullness. Patients are often awakened after the operation by sudden contractions of the levator ani, and the strangulated stumps seem to act as foreign bodies, keeping up irritation. The ligatures will ordinarily slough off from the seventh to the ninth day, but now and then they have to be removed by the surgeon. This complication occurs more frequently than the friends of the ligature would have us believe, and in such cases increased pain and delayed healing are always noticeable. The time required to remain indoors in such cases varies from three to six weeks.

As a rule, patients operated on by the ligature are able to be about from ten days to two weeks, although the ulceration may not be entirely healed. Many other operators have met with equally good success. This fact, coupled with the permanent cure which follows this operation, has won for it a very enviable reputation. At the same time there is one other operation—the following—that will be succeeded by just as good results, from which patients suffer much less, recover more quickly, and with as

few bad results as follow the ligature, namely: the clamp-and-cautery operation.

Bloodless method for treating hæmorrhoids, each hæmorrhoid being seized close to its base between the tips of the thumb, index, and middle fingers. It is put upon the stretch and twisted and finally so completely crushed that it is pulpified, and none of the investing tunics remain except the mucous membrane and its understratum of fibrous tissue. Thirty-two cases treated successfully by this method. Manley (Boston Med. and Surg. Jour., Feb. 1, '94).

Recovery followed all of the 269 cases treated in Dittel's service by Dittel's elastic ligature for hæmorrhoidal nodules.

Twelve days was the average time. No anæsthesia is used except Schleich's local infiltration. The curved polypus-forceps are guided by a finger of the left hand inserted into the rectum. By turning the forceps ninety degrees the nodule is brought up out of the anus, and with the surrounding mucosa is then ligated with an elastic cord stretched to its utmost. The nodules lose their vitality in eight to ten days and drop off, leaving a clean, granulating surface. The external anal skin must not be included in the ligature. Editorial (Jour. Amer. Med. Assoc., Nov. 6, '97).

The *clamp-and-cautery operation* was originated by Mr. Cusack, of Dublin, and brought prominently before the profession in England by Mr. Henry Smith. In America it is a question which is the more popular, the clamp-and-cautery or the ligature, both having advocates of equal ability. I have previously indicated my preference for the clamp-and-cautery operation. At present there are at our command many admirable clamps, the very popular Paquelin cautery, and the cautery irons. By the aid of these the operation can be performed with rapidity; and, when used with care, it is not a barbarous procedure, as is often claimed, but a scientific surgical opera-

tion, whereby only the diseased tissue is removed. The pain which follows the clamp-and-cautery operation is less than that of any other operation for piles.

There are four steps in the operation:

1. The sphincter-muscle should be thoroughly divulsed in every direction (Fig. 2). This will cause the piles to come quite prominently into view. Each in turn is seized with a vulsellum or catch-tooth forceps and drawn well down. 2. The mucous membrane and skin should be severed and the pile dissected upward

gated and a wedge-shaped compress placed over the anus and kept in place by a well-adjusted T-bandage.

When the piles are small or situated high up and cannot be drawn down and clamped, the narrow cautery-blade should be drawn once or twice across each pile; this will cause them to shrink up. The cautery may be applied, if used with discretion, to any dilated veins present that might at some future time form piles.

This operation is preferable to the

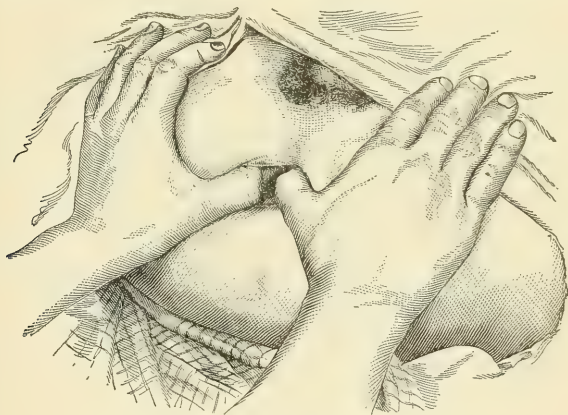


Fig. 2.—Dilatation of the sphincter ani. (*Gant.*)

- (Fig. 3). 3. The clamp should be adjusted firmly in the incision at the base of the tumor; that portion external to the clamp is then excised with a pair of scissors. 4. Every portion of the stump should be thoroughly cauterized with the cautery-point at a dull-red heat, after which the clamp should be loosened to see if bleeding occur (Fig. 4). If it does, the operator should readjust the clamp and cauterize all bleeding-points.

After all the piles have been removed in this way the rectum should be irri-

gated; not because the cure is more effective, or the operation less difficult to perform, but because of the facts that the operation can be performed more quickly, with greater ease and accuracy, and the patient's suffering is less and recovery is several days earlier than after the ligature. When the ligature has been applied ordinarily it will not slough off before the eighth day; and, when it does, it leaves an ulcer with irregular edges, which not infrequently has a tendency to become chronic.

At best, patients are rarely able to be about the room before the tenth day, and frequently not for two weeks; while after the cautery method the ulcer will be clean and smooth shortly after the operation, and will be practically healed by the time the ligature has sloughed off. Patients can sit up on the third or fourth day, and it is a rare occurrence if they are detained from business more than a week.

In many cases the time that is saved

ceedingly annoying. Retention of urine occurs sometimes, but not so frequently as after the ligature. Slight bleeding sometimes occurs at non-cauterized points when the clamp has been removed, but it will not do any harm when a firm wedge-shaped compress is placed over the anus and supported by a well-adjusted T-bandage.

Experience has shown that hæmorrhage will occur just as frequently from the slipping of the ligature, when it or

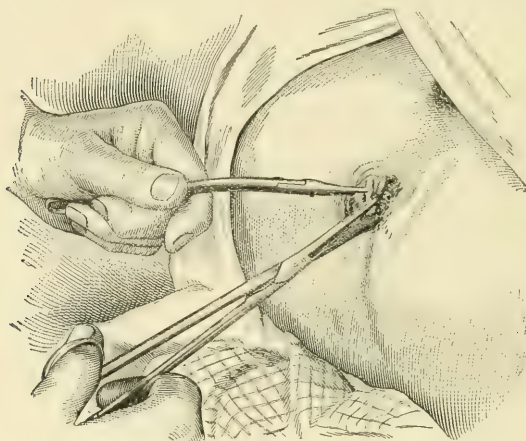


Fig. 3.—Severing the mucous membrane from the skin. (Gant.)

is represented by the length of time that it requires for the ligature to come away. Granting that some healing takes place while the ligature is sloughing, it will require as long for the remaining portion of the ulcer to heal as after the cautery operation; for the ulcerated surface after the latter seems to heal more readily than after the former operation. The pain after the cautery operation is insignificant if care has been used to *avoid cauterizing the skin*; but when it has been touched, if only slightly, the pain is ex-

the stump has been severed too closely, as after the clamp-and-cautery operation.

It is not probable that either tetanus or pyæmia will follow the cautery operation, for there is no constriction of terminal nerve-filaments, and the danger of sepsis has been minimized by searing the exposed surfaces. So far as a radical cure is concerned, the cautery and the ligature operations are on a level, for when either one has been performed as previously described a permanent cure will follow in every case.

One hundred to one hundred and fifty hæmorrhoid cases seen both during and after the operation with clamp and cautery. Apart from the fact that none of them had a single bad symptom of any kind, there were three points chiefly remarkable about them. First, the extremely small amount of blood lost; secondly, the trivial degree of pain afterward; third, the short time during which treatment lasted. Burghard (*Lancet*, Apr. 6, '93).

Advantages of the clamp and cautery: It is antiseptic; there are no sloughs to separate as in the ligature operation;

The writer's objection to the clamp-and-cautery operation is that in hæmorrhoids having a broad base the clamp picks up the hæmorrhoids and also a large portion of the mucous membrane, and on the removal of the clamp the edges of the mucous membrane separate and leave a large ulcer, which is slow to heal. George W. Crary (*N. Y. Med. Jour.*, Feb. 12, '98).

To reduce the pain and distress which commonly accompany the clamp and cautery operation for hæmorrhoids, the writer has adopted the following method: Immediately after the clamp-

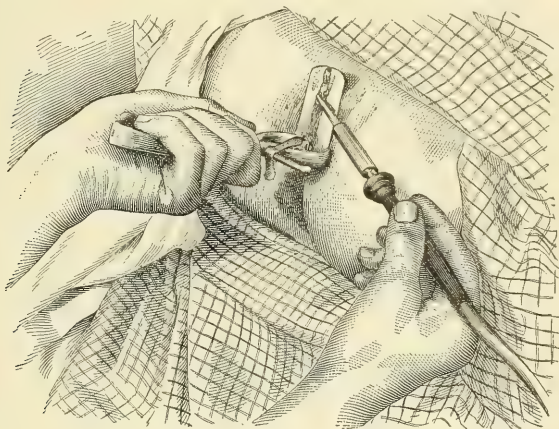


Fig. 4.—Cauterizing the stump. (*Gant.*)

there are no ligatures or sutures to offer any chance for infection; it is a radical cure; the operation is a rapid one; the time of convalescence can be definitely fixed—the eighth day.

The record of hæmorrhage, pyæmia, or death is almost negative. In five hundred cases operated upon in Mt. Sinai, by the above method, there has not been a single death. One case of pyæmia from which the patient recovered is recorded, and a few slight hæmorrhages; and, so far as can be ascertained, there have been no recurrences. Vaux (*Canadian Pract.*, Dec., '96).

ing and burning have been completed six or seven radiating incisions are made through the skin and well into the subcutaneous tissues with the scissors. There is usually smart hæmorrhage, but this is quickly checked by pressure and a dry dressing. In six hours a wet dressing may be applied. There is a free flow of serum from these incisions for the next day or two. Edema with its danger of infection is absent, and the patient is comfortable. This method has been thoroughly tested by the writer and a number of colleagues at the Mount Sinai Hospital

and has given great satisfaction. H. Lilienthal (Med. Rec., Aug. 27, 1904).

Clamps.—Until recently pile-clamps on the market were constructed like scissors. When that portion of a tumor external to the clamp was cut off, tissues except those nearest the heel slipped through before the operator had a chance to cauterize them. In this way patients were subjected to a serious, if not fatal, hæmorrhage.

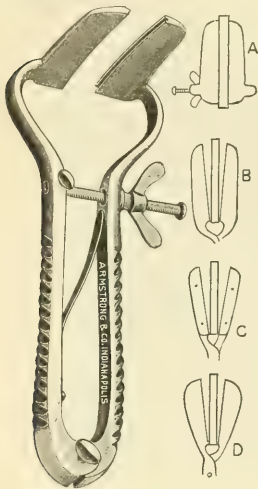


Fig. 5.—Gant's pile- and polypus- clamp. The letters show the different clamps and their clamping power. A, Gant's; B, Kelsey's; C, Smith's; D, Langenbeck's.

Some three or four years ago the writer constructed a clamp with the blades at right angles to the handle (see Fig. 5). This insures the blades' remaining parallel, distributing equal pressure, no matter how far apart they are, so that not the slightest portion of tissue can slip through and escape cauterization. When

this clamp is used hæmorrhage is improbable, if not impossible.

AFTER-TREATMENT.—After any operation for piles a well-adjusted pad to the anus, held in place by a T-bandage, supports the parts and renders the patient more comfortable, and tends to arrest any bleeding that might otherwise take place. I do not use suppositories, although many high in authority recommend the immediate employment of suppositories containing morphine, opium, belladonna, etc., for the relief of pain. As a rule, they produce an uncomfortable feeling and cause the patient to strain in his endeavors to force them out. When I am compelled to use anything for the relief of pain I prefer an hypodermic injection of $\frac{1}{4}$ grain of morphine. Ordinarily, this will not have to be repeated. When the pad applied to the anus becomes dry and hard, the anus should be sponged off with warm water and a new pad applied.

If the patient has been purged before the operation, it is not necessary to check intestinal action with opium, for no movement will occur before the third day. In case it does not, a Seidlitz powder or a dose of salts should be administered. If there is reason to believe the fæces are hard, an injection of soap-suds should be given to soften them.

Patients should be urged to remain in bed until the ulcerations have almost or entirely healed. Then, when they begin taking active exercise, the danger of the ulceration becoming chronic will be slight. The ulcerated surfaces should be cleansed daily, and, if there is the least tendency to become chronic, an application of calomel or silver nitrate (15 grains to the ounce) will stimulate them.

In case of retention of urine, hot stupes or poultices should be applied over the pelvis. This will frequently en-

able them to void urine independent of the catheter. If a catheter is used, a soft-rubber one is preferable, but should be cleansed in boiled, filtered water before and after each introduction. The diet after an operation should be limited to liquids and semisolids for the first four or five days; but patients should have nourishing soups, beef-tea, and soft-boiled eggs.

The Smith operation of clamp and cautery for hæmorrhoids when properly executed is one of the most satisfactory in surgery. The technique of the operation is somewhat different from that of most operations; yet, having employed it in over three hundred cases, the method is thoroughly recommended. The evening before the operation the patient is given 1 ounce of castor-oil, in the morning he receives an enema.

Under general anæsthesia the anus is thoroughly stretched and the rectum cleansed. Forceps are attached to each hæmorrhoid, the pile-clamps are applied, and the pile is burned evenly and slowly down to a solid button above the bite of the clamp (baked would probably be a more expressive term), never burning off smoothly along the clamp and never cutting off a pile with scissors previous to burning, although the skin may be cut to the subcutaneous tissue, if involved.

The small soldering irons are found to be the best for the purpose. Usually three groups of vessels need to be destroyed, anteriorly, and laterally and with a little practice all the hæmorrhoids can be grasped and included in three eschars. To prevent future contraction at least three separate one-half inches of mucous membrane in normal condition should line the anal opening. No more than four large piles, as a rule, should be removed by this method. If there be other small piles between they can be punctured with the small point cautery. The surrounding parts are protected from excessive heat or accidental slipping of the iron by a square of asbestos cloth with a cut in one side to allow it to slip beneath the clamp.

A little vaselin is applied to the anus on gauze and the patient put to bed. No tube or pack is inserted into the rectum; the operator who employs them has had reason to fear hæmorrhage, which is an occasional occurrence where the tops of the piles are cut away before cauterization or when they are not all marked at first with forceps, necessitating search and disturbance after some of the eschars are properly placed. Morphine is not often needed, but may be given the first day if necessary for pain. The bowels are moved on the fourth day by castor-oil. The only dressing is a little vaselin on cotton applied to the external parts. C. H. Mayo (St. Paul Med. Jour., Mar., 1901).

Prognosis.—In cases where bleeding, inflammation, and strangulation have been relieved by palliative measures, patients should be warned that they will probably have another attack. On the other hand, when all piles, dilated veins, and redundant tissue have been removed by the clamp-and-cautery or ligature operation, it is safe to tell them that they will not have a relapse.

Post-operative Hæmorrhage.—Occasionally after the best operations for piles the dressings will be saturated with blood. This, as a rule, need not cause uneasiness, for when due to bloody water left in the rectum after irrigation or from a superficial cut in making the mucocutaneous incision it will not amount to anything. On the other hand, when internal bleeding is suspected, the patient should be requested to empty the rectum. If bleeding has occurred, clots of blood will be discharged with the fæces. When there is reason to believe that the bleeding is due to a small vessel or to oozing, it can frequently be arrested by simply *tightening* the bandage. If this fail, the rectum should be irrigated for several minutes with cold or quite hot water, or with some one of the various astringent solutions, as alum-water, the infusion of

black-oak bark, etc. Astringent powders dusted over the bleeding parts, tannic acid, gallic acid, zinc, Monsell's powder, and other powders known to have a contracting effect on the tissues have all been recommended. Monsell's powder has been used more frequently than the others, but it has proved very



Fig. 6.—Drainage-tube wrapped with gauze.

undesirable, not because it did not arrest the bleeding, but on account of the filthy condition in which it leaves the wound.

When the hæmorrhage is profuse, time should not be wasted on injections and powders. The rectum should be exposed by means of a speculum and the bleeding vessel searched for until it is found and ligated or seared over with the Paquelin cautery. If the operator be not so fortunate as to have one of these instruments, a poker or a curling-iron may be heated to a red heat and used as a substitute. In case the vessel is situated so high that a ligature cannot be applied, it should be seized with a pair of artery-forceps and thoroughly twisted, and the forceps left on if necessary; for in cases of profuse hæmorrhage of the rectum the patient's life not infrequently depends upon the thoroughness of the work.

In case the bleeding-point cannot be located packing of the rectum should be resorted to. This must be done carefully, however. Gauze or other packing loosely inserted into the rectum does not arrest the bleeding.

The majority of operations for hæmorrhoids are performed on the lower inch

and a half of it. When bleeding occurs in this locality it can be speedily arrested by inserting into the rectum a firm piece of rubber tubing, three inches long and three-fourths of an inch in diameter, around which has been wrapped several layers of gauze. It can be kept in place by placing a safety-pin through the outer end and into a T-bandage. This makes a desirable compress and at the same time allows the escape of wind and discharges, and warns the attendant in case the bleeding has not been arrested (Fig. 6). Vulcanite tubes (Fig. 7), which are kept at most any instrument-dealer's store, act in the same way. The main factor in arresting hæmorrhage after any operation about the rectum, where the cautery or ligature cannot be used, is to make firm and constant pressure over the bleeding-points, so that not a single point of the rectum will be exempt from the pressure; when this has been accom-

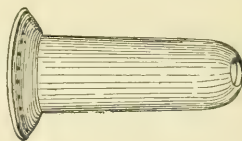


Fig. 7.—Vulcanite drainage-tube.

plished, we can retire with the assurance that our patient is perfectly safe and that all bleeding has been arrested.

S. G. GANT,

New York.

HAMAMELIS.—Hamamelis, or witch-hazel, consists of the leaves of *Hamamelis Virginiana*, a North American shrub growing east of the Mississippi River. The leaves, collected in the autumn when the twigs are flowering, have an odor resembling that of tea and an astringent, bitter taste. It contains

about 10 per cent. of tannin, bitter and odorous extractives, and a trace of oil.

Preparations and Doses.—The fresh leaves (*hamamelis*, U. S. P.) are used to prepare the fluid extract, which, although chiefly used as an external application, may be given internally in doses of $\frac{1}{4}$ to 1 drachm.

Therapeutics.—*Hamamelis* is hæmostatic, astringent, and tonic in its action. Containing considerable tannin, it coagulates the albuminous elements of the tissues, when applied locally, and diminishes the blood-supply and secretions.

In HÆMORRHAGE.—The fluid extract has been given internally for the relief of pulmonary, renal, and uterine hæmorrhage; purpura, hæmatemesis, varicose veins, and hæmorrhoids. The local application of *hamamelis* has been used for recent wounds, sprains, bruises, superficial hæmorrhage, hæmorrhoids, epistaxis, and for bleeding or discharges from the natural cavities or openings of the body.

AS AN ASTRINGENT. — *Hamamelis* is used, in diluted form, as a mouth-wash, as a gargle in chronic pharyngitis, and in spray after attacks of acute coryza (1 part to 8, or 1 part to 24). In relaxed conditions of the mucous membranes generally it is beneficial. Peristalsis and the secretions of enteritis are checked. It is of value in diarrhoea and dysentery.

HAY FEVER. See RESPIRATORY ORGANS, NEUROSES OF.

HEAD, INJURIES OF.

Diseases of the Scalp.

Tumors.—A common form is the *sebaceous tumor*, or *wen*. Varying in size from that of a pin's head to an orange, occurring singly or multiple, of slow growth, smooth, round or oval in shape, movable beneath the integument, they are familiar objects. They are readily

diagnosed from fatty tumors by their firmer consistence and smoother surface; evacuation and examination of contents will remove any doubt. The sebaceous cyst is distinguished from abscess by its slow growth, history, situation, mobility, and elasticity; the existence of the dilated opening of the sebaceous duct and the expression and examination of some of its contents will confirm the diagnosis.

The *treatment* is extirpation. After cleansing the hair and scalp the hair is evenly parted over the tumor, an incision made down to the sac, and the tumor enucleated. To prevent return, the sac should be entirely removed. Hutchinson reports a case in which an aggregation of small sebaceous tumors of the scalp became malignant in character. He, however, remarked the rarity of such disposition in sebaceous tumors.

HORNS.—If let alone, it occasionally happens that the sebaceous matter exudes through the sebaceous duct, and forms a scab or crust, which by a process of subdeposition becomes conical; and, being gradually pushed up from below, and assuming a dark-brown color by exposure, it forms an excrescence that resembles a horn. They may be removed by the knife.

WARTS AND MOLES.—Warts and moles are cutaneous hypertrophies. Warts when non-irritating and small require no attention, but, if they show a tendency to grow, they should be removed by the knife, as they sometimes display a malignant character. Moles are of two kinds: the hairy and the pigmented. They may be removed by the knife under cocaine anæsthesia. A subsequent plastic operation or transplantation of skin may be necessary to cover over the denuded surface.

FATTY TUMORS.—Fatty tumors are

rarely met with in the scalp. They resemble somewhat the sebaceous cyst, but are flatter, less globular, and more deeply seated. The treatment is similar to that of the sebaceous cyst: extirpation.

CONGENITAL CYSTS AND FIBROMATA.

—Congenital cysts and fibromata are occasionally found in the scalp. They are easily recognized and removed.

PNEUMATOCELE.—Pneumatocele, or a tumor filled with air, may result from spontaneous atrophy of the osseous tissues, producing a communication with the mastoid cells. The air then extends underneath the pericranium, forming a painless, smooth, elastic tumor, which is tympanitic to percussion, and which disappears, usually, under pressure. The treatment, ordinarily employed, is to empty the sac by pressure or aspiration and then apply a compress and roller bandage.

CAPILLARY VARIX, NÆVUS, ERECTILE TUMOR, VASCULAR GROWTH, OR MOTHER'S MARK.—Of these, two varieties are noted, depending upon the size of the capillary vessels which make up the tumor. When the capillary vessels are large, they usually form a *raspberry-like tumor*, at first small in size and somewhat elevated above the skin. Their tendency, if let alone, is to increase steadily in size, the capillary walls becoming thinner, until danger from serious hæmorrhage threatens. This variety should be removed early, especially if the tumor show any tendency to grow in size or to extend laterally. If small, the tumors may be removed by excision or ligature, the base in the latter procedure being transfixed by a harelip-pin and the ligature passed beneath it before tying. If larger, two pins may be inserted at right angles to each other, or a double ligature may be passed around a single pin; the larger tumors are best

ligated in sections. In any case care must be taken to insure the removal of the entire tumor.

The **PORT-WINE MARK** is composed of small, capillary vessels; extends over more or less surface; and exhibits little or no tendency to spread. It is more unsightly than dangerous. It is best removed by excision, if not too large, making the incisions so that a linear scar only shall remain. A small portion of the mark may be frozen, the surface cross-hatched with a fine knife, and the hæmorrhage arrested by firm pressure with blotting-paper. This process, repeated until the whole surface of the tumor has been treated, is said to be practically painless and to leave no appreciable scar. The cautery and escharotics have been used with success, but are not to be advised, on account of the unsightly scars which are left.

Cephalhæmatoma, or Caput Succedaneum.—During the birth of a child extravasation of blood and serum not infrequently occurs in that part of the scalp which presents, as a result of the passive congestion. The extravasation varies in degree according to the duration of labor and the severity of the pains. This swelling is called *caput succedaneum*. The seat of this extravasation is in the loose connective tissue external to the pericranium. The tumor is usually situated over the occipital or parietal bones near the posterior fontanelle, and is soft and painless. When the extravasation occurs beneath the pericranium, detaching the latter from the bone, the tumor is called *cephalhæmatoma*.

These conditions seldom require treatment, as they gradually diminish in size and finally disappear in a few days or weeks.

Fatal case of hæmorrhage under the scalp in a newborn infant. After delivery with forceps, the supposed caput, instead of decreasing, became larger, was found to be soft and fluctuating, and due to effusion of blood. On third day tumor extended over whole cranium. Infant pale; rectal temperature only 96.8° F. Tumor still increased, extending over frontal bones and down sides of skull. Death on tenth day. Autopsy showed firm blood-clot under scalp and above periosteum over entire cranium. C. W. Townsend (Boston Med. and Surg. Jour., Mar. 3, '98).

Wounds of the Scalp.—These are of common occurrence, and are more serious than similar injuries located elsewhere, especially in persons of vitiated or impaired constitution. These injuries are more likely to be followed by erysipelas, and have a great tendency to the propagation of inflammatory action inward to the brain, which latter gives a serious or even fatal aspect to comparatively slight lesions. It must not be forgotten, however, that the blow or fall which occasions the scalp-wound may produce concussion or even laceration of the brain. So far as the tissues of the scalp are concerned, there is little danger, for they are freely supplied with blood and are endowed with great vitality, so that repair is favored and sloughing seldom occurs even when the tissues are severely contused and extensively lacerated, the existence of a slight pedicle of attachment sufficing to insure the vitality of a large flap. It is, therefore, important to save all portions of the lacerated tissue unless entirely detached.

TREATMENT.—In all wounds except very small ones the head should be shaved over a wide area, to insure thorough cleansing and disinfection. All dirt and foreign matters should be removed by rubbing the surface with olive-oil, washing well with Castile soap

and warm water, and finally scrubbing the surface thoroughly with a solution of bichloride of mercury (1 to 1000). If the wound be a simple cut, it will often suffice to bring the edges together with a strip or two of adhesive plaster; it is generally better to bring the edges together and secure them accurately with sutures. A generous sublimate dressing should be applied and retained by a recurrent head bandage.

Conclusions regarding contusions of the scalp as follows:—

1. Contusions of scalp caused by slight blows or falls, accompanied by moderate amount of effusion, are simple and require little treatment.

2. Contusions of scalp caused by sharp blows or severe falls are always to be examined carefully, and a guarded prognosis given.

3. Those accompanied by large effusions, and especially if pulsating, should be treated by shaving scalp, incising, turning out clots (examining carefully the pericranium and skull), securing bleeding-points, closing with sutures, preferably braided silk, dressed with dry antiseptic dressing, which should only be removed when absolutely necessary, before the fourth or fifth day, when sutures should be removed, and a light compress bandage applied.

4. Those accompanied by little or no swelling, when caused by severe blows, should be carefully watched, and on first appearance of local fever or swelling, freely incised, washed out, and treated as open wounds.

5. If the case is not seen until patient has had chills, hot dry skin, hard pulse, fever-coated tongue, nausea or vomiting, insomnia, nervous twitchings, or any other symptoms of meningeal inflammation, we should cut down and trephine at once over site of injury.

6. While inflammation of either pericranium or the meninges is one of the things likely to follow these injuries, it may be prevented by early incision.

7. Where caries of bone or meninges occurs, the cause may generally be found to be injury of pericranium, which be-

comes inflamed, effusion follows, then inflammation of vessels from pressure, and then, by extension, meningitis. F. F. Lawrence (*Columbus Med. Jour.*; *Indian Lancet*, July 16, '97).

Though the scalp be bruised, lacerated, and begrimed with dirt, as well as wounded, or a larger or smaller flap be separated from the bone, none should be cut away; but, after shaving the head and arresting hæmorrhage by ligature or compression, it should be cleansed and disinfected thoroughly and the parts replaced in their proper positions. The parts may then be retained and supported by a few strips of plaster, and silver-wire sutures may be inserted at the points of greatest traction. Usually no drainage will be required, but, if necessary, a few strands of disinfected horse-hair will meet the indications, to be removed, however, in a day or two. To insure an aseptic course of healing thorough and wide disinfection should be practiced.

Abscess of the Scalp.—Abscess of the scalp may follow erysipelatous inflammation, contusions, or the imperfect disinfection and careless dressing of wounds of the scalp.

The symptoms of abscess are an erysipelatous condition of the scalp, accompanied with pain and usually marked œdema and pitting on pressure. There is usually some fever, at times intense and often accompanied with delirium. There is great danger from the burrowing of the pus; if it burrow beneath the pericranium, and sometimes if more superficial, there is danger that the inflammation may extend inward to the brain through the vascular openings in the skull and cause meningitis.

TREATMENT.—Free incision should be made, as soon as the abscess is discovered, at the most dependent point. Disinfection of the wound and drainage

should be followed by antiseptic dressings and drainage.

Contusions of the Scalp.—These are commonly the result of blows or falls which leave the patient more or less stunned. Localized swelling occurs at the point of impact, which is due to hæmorrhage and effusion under the scalp, the latter being raised up into a soft, semifluctuating tumor, the edges of which feel hard, while the centre feels soft. In some cases this extravasation simulates a depressed fracture of the skull, especially in children, and this deceptive feeling will occur without any considerable extravasation of blood beneath the scalp, the depressed centre being due to the compression of the scalp by the blow that has inflicted it (Erichsen). In case of doubt it will be safer to make an incision so as to examine the state of the bone, but usually the smooth bone can be felt at the bottom of the soft central depression.

Violence of no great intensity, when applied to a limited area of the skull, may cause a fracture with only a momentary displacement, with a rupture of a meningeal artery, or a rupture of an artery without fracture. A localizing injury which may lead to a fracture without displacement and hæmorrhage does not, as a rule, cause a serious permanent brain-lesion, if early and judicious surgical treatment is employed. A fracture may occur without apparent displacement, yet the pressure on the brain exists which may cause remote results. D. S. Fairchild (*Jour. Amer. Med. Assoc.*, Sept. 7, 1901).

TREATMENT.—The treatment of contusion of the scalp is very simple. The use of some evaporating lotion or lead-water and laudanum with slight pressure is usually sufficient. Under no circumstance should the swelling be punctured or the blood let out in any other way. Erichsen has found contusion of

the scalp in girls and young women in some cases to be followed by severe neuralgic pains in the part struck. In such cases incisions down to the bone have been followed by improvement.

Severe contusions may cause concussion or laceration of the brain.

Technique of Intracranial Surgery.—

The consideration of the technique of cerebral operations as here presented is that advocated by L. McLane Tiffany, of Baltimore. It is important to notice that these operations may be rendered necessary by traumatic or pathological lesions. The two should be considered quite separately, since comparison between them is almost impossible. In traumatic cases operation is undertaken as a matter of necessity, suddenly, perhaps with instruments not entirely suitable, but certainly without delay, the condition of the patient not permitting it. No previous preparation of the patient or preparatory treatment has been possible. His general condition is unknown. Septic elements are often—in deed, generally—present, not only upon the surfaces, but have, perhaps, been introduced deeply into the tissues by the traumatism for which the operation is undertaken, and infection may have already occurred within the head. The condition of the kidneys may be unknown to the surgeon; for, even though the urine be examined immediately after the injury and before the operation is undertaken,—and this should always be done,—yet, if the patient has been transported a certain distance in cold weather, or the surface of the body has been largely uncovered, as is not unusual after an injury, albumin may generally be found, and possibly also casts. The details in operative work, also, are often obscure, and landmarks obliterated, both within and without the skull. The head

is opened, in traumatic cases, as circumstances permit or seem to indicate. The head may have already been opened before the case is seen by the surgeon, who is forced to do patch-work.

In operations for pathological conditions the reverse of what has been said exists. The proper time is chosen; all things are prepared beforehand; the proper light is provided; asepsis is secured; there is a due regard for both local and general cleanliness; the condition of the internal organs has been learned, and they have been made to functionate properly; a well and carefully considered operative procedure is carried through after due study and consideration, and all necessary things are at hand. The operation then is undertaken in the best way for the patient's welfare.

An aseptic field of operation is pre-eminently essential to success. In cerebral surgery it is best that the whole head should be prepared and cleaned in all cases, unless of a very minor character.

In traumatic cases the head is to be shaved and the skin cleaned with green soap, hot water, nail-brush, and carefully scrubbed. The ears should be cleaned out and filled with sterile cotton. The eyes should be closed with pads of sterile cotton. The scrubbing should be done, not only upon the surface, but, if a wound exist, it should be scrubbed likewise, and an effort made to get out any dirt which has been forced beneath the skin; punctured wounds should be laid open; tracks beneath the skin should be opened and scrubbed; the edges of irregularly-bruised tissue may be trimmed away and a clean surface obtained. When coal-dust or grease has been forced beneath the surface, scrubbing with a nail-brush and soap and

washing with ether and alcohol will often be sufficient to obtain a clean surface. Dirt ground into the surface or edges of broken bone can be scraped away, or nibbled away with forceps, so as to be gotten rid of. After cleansing the head for traumatic operations a towel wrung out in corrosive-sublimate solution (1-2000), or sterile water, perhaps, can be used as a cover for the prepared region until the instruments and other things are ready. In preparing a patient for an operation undertaken for some pathological condition (not traumatic, of course) the patient is prepared a day before the operation, and then again just prior to the operation. An alkaline (sodium bicarbonate) solution may be found useful to remove dandruff from the scalp, but Tiffany advises the use of green soap. Shaving and scrubbing with green soap, or a poultice of green soap applied over the surface after shaving and left on for a couple of hours and then scrubbing afterward, is efficacious. The green soap should be removed with alcohol, then ether, and the clean scalp tied up in a moist corrosive-sublimate dressing until the following day; a repetition of the cleansing as already described gives a clean surface upon which to operate.

As the brain is to be covered in after the operation, a large horseshoe-shaped osteocutaneous flap with a diameter of about three inches, the base turned toward the source of the blood-supply, is probably the most effective manner of uncovering the brain. It should be cut in one piece so as to permit of being turned down. This breaking down at the base is facilitated by cutting across the bone with sharp forceps, or otherwise, and it should be so cared for during operation that the skin and bone are not torn asunder; it may be necessary to

envelop it in a cloth wrung out in hot, sterile, salt solution.

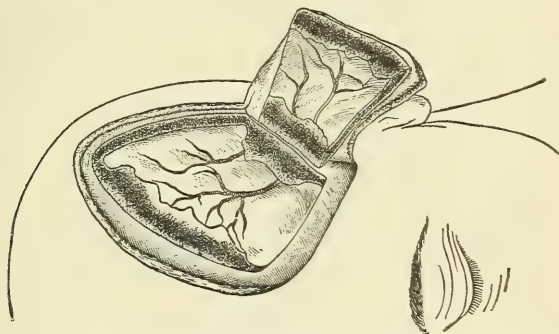
The patient being in the semirecumbent position, in order to diminish the amount of hæmorrhage, the fissures—so far as desired—may be marked on the scalp with an aniline pencil; and also three points on the bone beneath—the point at which the centre-pin of the trephine is to be applied, and the upper and lower ends of the fissure of Rolando at points just outside the flap; the centre-pin of another trephine may be used for this purpose. The cutting of the bone is to be done by the instrument with which the surgeon is most familiar; the trephine, the rapidly-revolving saw, chisel and mallet, the Gigli wire saw, all have their advocates. Should the opening not be large enough in the skull, there should be no hesitation to cut away the borders of the opening with rongeur forceps until sufficiently large.

The wire saw in resecting a portion of the cranium is used as follows: Having decided upon the outline of the three-sided flap which is to be turned down, two small incisions are made at the upper corners just sufficiently large to allow the application of a small trephine. As soon as the holes have been drilled a director with a beak turning off almost at a right angle, and grooved so as to properly direct a thin piece of whalebone between the dura and bone, is inserted with the beak placed between the dura and skull. The whalebone threaded on the end with a long piece of strong and thin silk is then pushed gently on in the direction of the other trephine opening until it comes in view, when the thread is partially drawn out. Each of the remaining sides of the flap is treated in a like manner. One end of the thread is attached to a wire screw, and the saw drawn through between the skull and the whalebones. The skin-incisions are now completed and the bone sawed through. Leonardo Gigli (*Centralb. f. Chir.*, No. 16, '98).

There is a difference between the sides of the skull and the top; bone need not be put back in the temporal fossa, for, by reason of the presence of the dense temporal fascia, there is not much sinking in; it is otherwise at the top and front of the skull, as an absence of bone results in a deep depression. The time consumed in exposing the brain is largely the result of the bone-cutting. It is therefore a matter worthy of thought and careful consideration whether, when it becomes necessary to operate within the head, it may not be expedient to raise a large flap, remove

one-third of an inch internal to the bone-section, so as to allow of suturing and replacement. In general, the dura is to be respected and treated like other serous membrane, and with no more consideration.

Hæmorrhage from the skin may be arrested with hæmostatic forceps. With a transverse bar at the top, a T-shaped blade, a large area of skin would be pressed upon and bleeding be better arrested; perhaps the T-shaped blade could, with advantage, be covered with rubber. Encircling the cranium with a rubber band has yielded satisfactory re-



Temporary resection of the skull. (*Chipault.*)

(Gazette des Hôpitaux.)

the necessary bone, replace the flap, and allow it to heal. A month or two afterward the surgeon can operate to remove the pathological condition more rapidly, bone not obstructing.

All operations on the brain should be done in two, or even more, stages, with a few days' interval between. A. Chipault (Gaz. des Hôp., May 26, '98).

It has been observed that opening the skull, even in incurable cases, may diminish pain and optic neuritis. The dura is to be divided and turned aside as a flap, the line of division being about

sults. Hæmorrhage from the bone during the cutting may be arrested by Horsley's aseptic wax, or pressure with dry gauze. By crushing in the edges of the bone with heavy forceps bleeding from the diploë may usually be arrested. In hæmorrhage from the dura a fine ligature passed around the artery and tied suffices to stop bleeding. Venous hæmorrhage may be arrested in the same manner. Hæmorrhage from a sinus may be arrested in several ways: by suturing the wound in the vessels with a curved needle, passing the thread around it and

tying it, and by gauze pressure. After turning the dura back and exposing the surface of the brain, bleeding-vessels are to be looked for and tied carefully, without dragging, by two ligatures, and divided between. Forceps will generally tear off, and should not be employed, save very temporarily. Serre-fines may be of use.

Tumors within the brain will push up sulci from below, so that vessels can be tied more easily than in the normal brain. A growth should be encircled by ligatures under these circumstances. The material used in ligating varies. Tiffany used very fine sterile silk. Finally, there is that form of hæmorrhage which may come from the exposed surface of a growth, and is usually denominated parenchymatous. Pressure with gauze will effectually arrest this. It may be that the gauze can be taken away at the end of the operation; usually it is to be left protruding and removed in two or three days.

In regard to the anæsthetic: Special indications for one or the other anæsthetic lacking, chloroform may be employed, as intracranial congestion is probably lessened thereby. Under ether the face becomes congested; a similar condition may obtain within the skull.

Tiffany has a cast of the brain at hand to refer to, while operating, for comparison with the exposed area. Electrical stimulation of the exposed area, by methods now well known, aid the operator.

When operating for a tumor of the brain which is covered by the cortex, the color and consistency of the exposed area may give information, but an incision will probably be of advantage. Certain growths have the same consistency as the brain, and have been traversed by needles without recognition;

hence color and consistency failing to be recognized, probably an incision into the brain is best; touch followed by incision, if the tumor does not present, is far better than touch followed by puncture, unless a cyst is discovered.

In many cases of tumor, the cortex is greatly displaced, but it is also probable that where the cortex is removed restoration of function, to a certain extent at all events, will follow. Circumscribed growths may be taken away by spoon, finger, knife, etc., but infiltrated growths, while they may be taken away, so far as can be recognized by the operator, give most unsatisfactory ultimate results, recurrence being the rule. The dura, being removed, should be replaced by gold foil, as advised by Beech, of Boston; or by rubber tissue, as practiced by Abbe; or by a thin sheet of celluloid, as employed by McCoch; or egg-membrane (Freeman) to prevent adhesions between the brain and scalp.

The following advantages are claimed for the use of egg-membrane in cerebral surgery: 1. That it is inexpensive and can be easily obtained where such substances as gold foil are not at hand. 2. It is not in the full sense of the term a "foreign body," but seems, in a measure, to incorporate itself with surrounding tissues without causing perceptible irritation or the formation of noticeable cicatricial deposits. Even though it ultimately becomes absorbed, it remains intact sufficiently long to accomplish the purpose for which it was inserted. 3. There is no danger of subsequent infection requiring a second operation and leading to extensive formation of connective tissue. Leonard Freeman (*Annals of Surg.*, Oct., '98).

Intracranial sutures may be of silk or fine catgut. To obtain a bone-flap where it is thought necessary, when the natural bone is lacking, different expedients have been made use of: the periosteum from the tibia has been trans-

ferred to the head; the outer table of skull, while connected with the skin, has been fashioned as a flap to turn over and cover the defect; the removed bone, perforated with holes so as to permit of drainage, has been used; bone-chips obtained by the use of the chisel or gouge on the adjacent sound bone have been placed on the dura, as a mosaic with the outer side downward. These are known as autoplasty. When a piece of foreign material, as silver, celluloid, decalcified ox-bone, calcined ox-bone, or aluminium is used, it is called heteroplasty.

Series of experiments on the skulls of animals to determine what happens to the disk of bone transplanted in the hole made by the trephine.

It was found that the implanted bones undergo necrosis in the central parts, but that there is a more or less extensive zone at the periphery which preserves its vitality, and becomes incorporated with the newly-formed bone. The extent of this peripheral area is closely related to the youth of the subject and the slenderness of the cranium—the younger the subject and the thinner the skull, the greater the peripheral area of retained vitality in the implanted bone. The rapidity with which the dead parts of the bone become absorbed and the new bone formed is closely related to the youth of the subject and to the sponginess of the bone. Experiments with decalcified and with calcined bone clearly showed the greater advantage of the latter in the formation of strong bony tissue. Valan (*Archivio per le Sci. Med.*, vol. xxii, No. 19, '99).

For the skin subcutaneous sutures of silk-worm gut are desirable. When the head has been opened for extensive operation, drainage is important. A piece of silver wire hooked in the lower angle of the wound, or a small drainage-tube will answer; if the latter, it should be removed after twenty-four or forty-eight hours, unless abscess develop, when it

should remain several days. A voluminous dressing of sterile absorbent gauze secured by roller bandage or night-cap will afford protection and support. The time when dressings are to be changed will vary with the conditions present. As a rule, half the stitches may be removed on the fifth or sixth day; the remainder by the seventh or eighth day. Absolute quiet of mind and body should be observed for the first week, and no visitors, letters, or other disturbance for two weeks at least.

In 104 craniectomies had 6 deaths. Of 57 adults operated upon no deaths from shock of operation; 3 died from sepsis; 1 from hæmorrhage, and 2 from complications due to teething (one seven days, other ten days after operation). Patients removed from operating-table without showing any shock or unfavorable symptoms other than those following serious operation. Electric saw used after trephine. Powell (*Archives of Ped.*, May, '99).

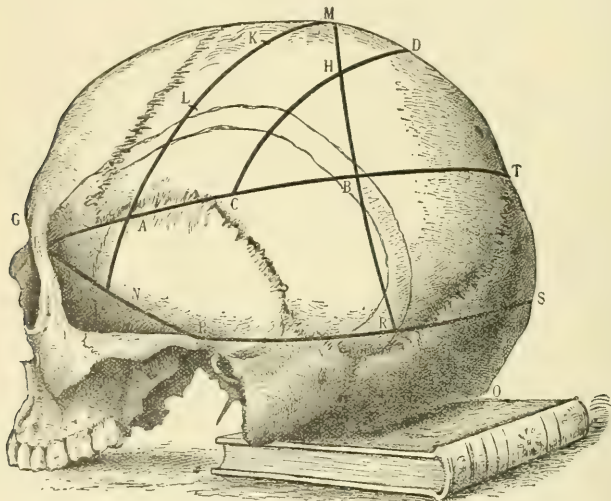
Cerebral Localization.—In addition to the motor areas around the fissure of Rolando, operating surgeons should be familiar with the relations of the temporo-sphenoidal lobe with ear disease; the supramarginal convolutions in puncture of the lateral ventricles; the angular convolution in word-blindness; the occipital lobe in lesions of sight; in fact, the relations of the whole brain, except the anterior extremities of the parietal lobes. Chiene, of Edinburgh, suggests the following method of cerebral localization: Shave the head and find, in the median line of the skull, between the glabella (*G*) and the external occipital protuberance (*O*), the following points: The midpoint (*M*), the three-fourths point (*T*), and the seven-eighths point (*S*). Find also the external angular process (*E*) and the root of the zygoma (*P*) immediately above and in front of the external auditory meatus.

Having found these five points, join *EP*, *PS*, and *ET*. Bisect *EP* and *PS* at *N* and *R*; also bisect *AB* at *C* and draw *CD* parallel to *AM*. The pentagon (*ACBRPN*) corresponds to the temporo-sphenoidal lobe, with the exception of its apex, which is a little in front of *N*. *MDCA* correspond to the Rolandic area, containing the fissure of Rolando, and the ascending frontal and the ascending parietal convolutions. *A* is over the an-

is at *B*. (For motor, speech, and special sensory areas, etc., see illustrations in **TUMORS OF THE BRAIN.**)

Diseases, Malformations, and Injuries Involving the Skull.

INFLAMMATION, PERIOSTITIS, OTITIS, CARIES, and NECROSIS may occur in the cranial bones. The symptoms are very similar to those produced by the same processes elsewhere. In necrosis of the cranial bones there is always the dan-



Cerebral localization. (*Chiene.*)

(Edinburgh Medical Journal.)

terior branch of the middle meningeal artery and the bifurcation of the Sylvian fissure; *AC* follows its horizontal limb. The lateral sinus at its highest point touches the line *PS* at *R*. *MA* corresponds to the precentral sulcus, and, if it be trisected at *K* and *L*, these points will correspond to the origins of the superior and inferior frontal sulci. The supramarginal convolution lies in the triangle *HBC*. The angular gyrus

ger of extension of the inflammation to the membranes of the brain and inflammatory effusion within the skull, producing convulsions, coma, or death. Affection of the petrous portion of the temporal bone gives rise to the greatest danger, on account of the homogeneous structure of the bone and the continuity of the dura mater with the lining of the cavities by which it is perforated. When the frontal bone or the vault is the seat

of disease, cerebral complications are less likely to occur.

Symptoms.—When the vault or forehead is affected there is tenderness, with some puffiness, and gradual elevation of the scalp into an abscess. If this be opened, the necrosed bone may be seen or felt at the bottom of a sinus or unhealed ulcer. When the petrous portion of the temporal bone is affected, there will be a history of earache, followed by a profuse foetid discharge from the ear, with tympanic perforation, escape of the middle-ear bones, and deafness. When the sphenoid or ethmoid is affected, deep-seated pains in the head, persistent œdema of the eyelids, and a foetid discharge from the nose will be present.

Etiology.—These inflammatory disorders of the cranial bones are usually consequent upon injury or constitutional syphilis; more rarely they result from struma (tuberculosis) or follow typhoid fever.

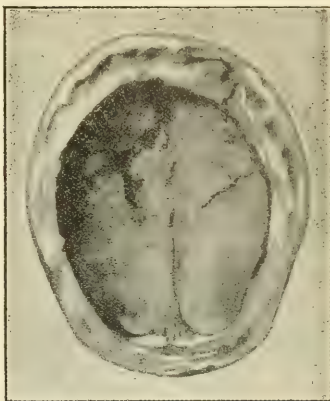
Prognosis.—Necrosis of the petrous portion of the temporal bone is generally incurable, death usually resulting from encephalitis. In necrosis of the sphenoid or ethmoid little can be expected from operative interference, though in the latter case portions of the sequestrum may occasionally be extracted through the nasal cavity.

Treatment.—The treatment of the inflammatory disorders of the bones of the skull follows the general rule of treatment of these disorders. It is, however, especially important that by absolute cleanliness, frequent dressings, and the liberal use of antiseptics, the parts be kept, as far as possible, in an aseptic condition. (See also OSSEOUS SYSTEM, DISEASES OF.)

HYPERTROPHY OF THE BONES OF THE SKULL, with increase of density and obliteration of the diploë, may result from

ostitis deformans or hereditary syphilis. Treatment is seldom required.

A very interesting specimen of hyperostosis crani given by Herwirsch to the College of Physicians of Philadelphia is from a woman aged 71. The patient enjoyed good health up to her sixty-fourth year, when rheumatism confined her to bed for one year. Previous to this had lively disposition and was a hard worker. During this illness enlargement of head began. She became listless, disinclined to any conversation, and made frequent cries at night. She had insomnia, and near her death she refused



Hyperostosis of the cranium. (Herwirsch.)

food and became comatose. Head measured 71 centimetres in fronto-occipital circumference. Lower half of head not enlarged. Calvarium soft and friable. Brain weighed 1360 grammes (48 ounces); normal except some ventricular dilatation and thickened dura. Skull at thickest part (right occipital) measured 3.5 centimetres; at the frontal 2 centimetres, and at thinnest portion (left temporal), 1.4 centimetres; weight of skull-cap, 1870 grammes (4 pounds, 2 ounces). Guy Hinsdale (Codex Medicus, May, '96).

ATROPHY OF THE BONES OF THE SKULL.—This condition is often ob-

served in senile skulls, and appears to be one of the phases of general wasting atrophy incident to senility. When observed in young subjects this condition is generally due to hereditary syphilis. The cranial bones may become so thin that they will crackle on slight pressure. Its favorite location is the occipital bones; it is often called *craniotabes*. The treatment for these latter cases is that for hereditary syphilis combined with codliver-oil and the hypophosphites of lime and soda. All mechanical injuries — blows, falls, etc. — must be averted.

MICROCEPHALUS. — When a child is born with complete ossification of the skull, even at the fontanelles, or when ossification is completed soon after birth, *microcephalus* generally results. To remedy this condition and allow a more rapid expansion and growth of the brain Lannelongue has suggested that a groove, about a quarter of an inch wide, be excised in the skull. This may be made on one side of the sagittal suture or on both sides, and may extend from the front line of the hair on the middle of the forehead well back into the occipital bone, and may have lateral branches. This operation should be done on only one side at a time, and is not devoid of danger, since the general vitality of such children is usually impaired. Keen, of Philadelphia, reduces the time of operation to not more than thirty minutes by using a *rongeur* forceps which he has devised for the purpose.

Tumors of the Skull. — *Exostosis*, or bony tumor, may occur as a result of injury, but is usually a tertiary syphilitic manifestation, a result of a syphilitic gumma. If the growth is within the skull it is called an *enostosis*; if external, *exostosis*.

The general treatment is that for syphilis of the bones. If the tumor is external and gives annoyance, it may be removed. If internal, and it can be located by its pressure effects upon the brain, the skull should be trephined and the tumor removed. Sometimes a growth upon the outside corresponds with a similar growth within the skull.

SARCOMA. — Round-, spindle-, and giant-celled sarcoma may affect the bones of the skull. The tumor may arise in the dura, the diploë, or in the periosteum. As the size of the tumor increases so does the danger and deformity. Sarcoma arising from the dura perforates the cranium and sometimes spreads underneath the scalp, finally breaking through the latter. The opening in the bone, the pulsation of the mass, its partial or complete reducibility, generally accompanied with symptoms of pressure, and the presence of the optic neuritis which often results from it, enable one to diagnose this growth.

The growth may be removed, but recurrence always follows. The operation itself involves such danger as often to be fatal, especially if the superior longitudinal sinus be involved.

EPITHELIOMA sometimes invades the cranial bones. Like sarcoma, it is a malignant disease, and is treated on the same general principles.

FRACTURES OF THE BONES OF THE SKULL. See **FRACTURES**.

Diseases, Malformations, and Injuries Involving the Brain.

Inflammation of the Brain. See **ENCEPHALITIS**.

Abscess of the Brain. See **CEREBRAL ABSCESS**.

Meningocele, Encephalocele, and Hydroencephalocele. See **ENCEPHALOCLE**.

Hydrocephalus, Acute and Chronic. See **HYDROCEPHALUS**.

Intracranial Tumors. See TUMORS OF THE BRAIN.

Traumatic Intracranial Hæmorrhage.

—Extravasation of blood commonly occurs in all injuries of the head accompanied by laceration of the brain, and in many in which the skull is fractured and the brain uninjured. Intracranial hæmorrhage is favored by the great vascularity of the parts within the skull, the large sinuses, the numerous arteries that ramify both within the bones and at the base of the brain, and the intricate vascular net-work extended over the surface of the brain.

The extravasation may occur in three situations: Between the dura mater and the skull (extradural); between the dura mater and the brain (subdural); within the brain-substance and its ventricles (cerebral).

Extradural Hæmorrhage.—This form of hæmorrhage is also called *meningeal extravasation*, as it most commonly arises from rupture of the middle meningeal artery or its branches, which, from its location in a deep canal in the parietal bone, is peculiarly liable to rupture in injuries of the side of the skull.

SYMPTOMS.—The symptoms of extradural hæmorrhage are those of compression, divisible into three stages: concussion, a return and some continuance of consciousness (pathognomonic of this condition), and then coma gradually supervening. The patient is at first stunned by the accident; from this he quickly recovers and then relapses into unconsciousness, which gradually increases in intensity. He becomes dull and sleepy, with a slow, laboring pulse, dilated and sluggish pupils; and a tendency to slower respiration. As the compression increases, complete stupor supervenes, with stertorous breathing, and the appearance of either general

paralysis or hemiplegia of the side opposite to the injury.

DIAGNOSIS.—The diagnosis of this and the following (subdural) form of hæmorrhage from the *cerebral* form is important, as no operative interference in the latter case would be successfully undertaken, for the reason that the injury to the brain-substance is usually so extensive that, even were the clot removed, the patient would die from the injury. Attention to the symptoms of each variety will usually be sufficient to differentiate them.

The diagnosis between compression from *extravasation* and that from *depressed bone* or *inflammatory effusions* within the skull is generally easily made. In depressed fracture the compression symptoms continue uninterruptedly; examination will reveal the injured bone. Compression symptoms due to inflammatory effusions are preceded by symptoms of cerebral inflammation, and are accompanied by a strong febrile movement, accelerated pulse, and hot skin; the character of the scalp-wound and the separation of the dura mater when pus is effused distinguish this form from that in which the pressure is the result of extradural or subdural hæmorrhage.

From apoplexy differentiation is not easy. From drunkenness, the absence of injury, the odor of the breath, and the flushed and turgid face would point to alcoholic intoxication.

In opium narcosis the pupils are strongly contracted, instead of being widely open as in coma from cerebral compression.

ETIOLOGY.—Extradural hæmorrhage may occur with or without fracture of the skull. When the result of fracture, it is caused by the fissure tearing across the meningeal artery or more often one of its branches distributed on

the interior of the skull, or a fragment of bone wounding a sinus or the vascular net-work on the cerebral surface.

PATHOLOGY.—The blood that is extravasated usually coagulates into a firm, granular clot. This clot may be absorbed entirely; the serous portions and coloring matter may become absorbed, leaving a fibrinous, buff-colored clot, which may become organized; and finally the exterior of the clot may become organized, while the interior may contain fluid and disintegrated blood.

PROGNOSIS.—The mortality of these cases treated upon the expectant plan (without operation) is very high. Wiesmann reports 147 cases treated expectantly with 131 (89.1 per cent.) deaths, while of 110 cases operated on only 36 (32.7 per cent.) died, and in the majority of the fatal cases the extravasation was not reached and the clot therefore not removed.

TREATMENT.—Operative treatment should be resorted to as soon as the diagnosis has been clearly made. The localizing symptoms should determine the spot to be trephined. Krönlein has shown that, in the greater number of cases, the clot will be most easily reached by trephining one inch and a quarter behind the external angular process at the upper level of the orbit. If the clot is not found by this opening we may trephine just below the parietal boss, on the same level with the former opening. The main trunk and the anterior branch of the middle meningeal artery are reached by the anterior opening, and the posterior branch by the posterior opening. If the clot be discovered it should be removed, enlarging either trephine opening, if necessary, by the rongeur forceps. If the pupil be dilated, showing that the clot is gravitating downward toward the base, the trephine open-

ing should be made near the first point, but about one-half inch lower. After the clot has been scooped out gently, the cavity should be well washed out with freshly boiled water cooled down to blood-heat. If the artery is still bleeding, a semicircular Hagedorn needle armed with catgut should be passed through the dura, under the artery, and out again through the dura on the other side of the artery, and the artery tied. Drainage should be provided and the wound treated antiseptically. A second trephine opening should be immediately made if the first trephine opening does not answer well for drainage in the recumbent posture. (W. W. Keen.)

Subdural Hæmorrhage.—This hæmorrhage generally occurs from the rupture of a number of small vessels, or of one large vessel (especially the middle cerebral), the extravasation being located under the dura mater.

SYMPTOMS.—The symptoms and treatment are very much the same, the differentiation between this and the preceding variety not having yet been made out.

ETIOLOGY.—This hæmorrhage occurs most frequently as a result of depressed fracture. A few cases have been reported as due to pachymeningitis interna, which cases should be treated by trephining, evacuation, and drainage.

PATHOLOGY.—The patient often dies from direct injury to the brain. If he recovers, the clot, having produced more or less paralysis, is gradually absorbed, but the brain may not expand to its former position, being permanently depressed, the site of the injury being sometimes occupied by spongy connective tissue, the meshes of which are filled with cerebro-spinal fluid, resembling a series of cysts. The paralysis will gradually lessen and may almost entirely dis-

appear, but, after a period of from a few months up to two or three years, epileptic or other cerebral disturbance may appear and persist throughout life.

TREATMENT.—The treatment is the same as for the preceding variety of hæmorrhage. The anterior trephine opening, already referred to, if enlarged upward and backward, will give access to the middle cerebral arteries, and, if symptoms indicate intracranial hæmorrhage, and no clot is found under the bone on trephining, the dura should be opened and the clot searched for along the fissure of Sylvius, in which the middle cerebral lies. If this artery be the source of hæmorrhage, the bleeding-point must be found and the artery tied. (Keen.)

Cerebral Hæmorrhage. See CEREBRAL HÆMORRHAGE.

Compression of the Brain.—This is a not uncommon condition in injuries of the head, arising from various causes. In whatever way this condition is brought about, from the pressure of extravasated blood, of pus or other inflammatory exudate, of a depressed portion of bone from fracture or new growth, or from a foreign body lodged there, the symptoms, although presenting some differences, are, for the most part, constant. The patient lies in a state of lethargy, stupor, or coma, more or less completely paralyzed, heavy, insensible, and drowsy, either not responding when addressed or only when spoken to in a loud tone of voice, and perhaps only when violently shaken. The respirations are slow and deep, with stertor or snoring, and usually a peculiar blowing sound. Paralysis of the velum palati, which, hanging down as a curtain, is thrown into vibrations during expiration, seems to cause the stertor; the distension of the cheeks and the

blowing sound are due to muscular paralysis of the lips and cheeks. The pulse is full and often slow; one or both pupils are dilated; paralysis of the sphincter ani causes involuntary evacuation of the fæces, and paralysis of the bladder generally causes retention of the urine; the skin may be cool, but is, in many cases, rather warm and covered with perspiration. Frequently the condition of stupor alternates with paroxysms of delirium or of local convulsive action. This condition of coma may become complicated by the appearance of symptoms of inflammation. Unless the cause that produces the compression is removed, death quickly follows, the coma deepening and the patient dying in an apoplectic condition. In rare cases, the coma may continue for many weeks or months, until the cause of compression is removed, when consciousness will return and the symptoms suddenly disappear. The treatment of this condition is obvious.

Wounds of the Brain.—These are produced by severe blows or falls; by kicks; by the penetration of knives, swords, bayonets, rifle-balls, etc.; by sharp spicula of depressed fractures, and by *contrecoup* with or without fracture. These wounds may be received on sides or vault of the cranium or through the mouth, nose, or orbit. These wounds are usually accompanied by fracture of the skull: in many cases punctured fractures of most dangerous character. They are all more or less septic in character, with laceration of the brain-substance, the deposition of foreign bodies (fragments of bone, hair, clothing, bullets, etc.), more or less severe hæmorrhage, and in many cases with loss of brain-substance. More rarely—as in children—the wound may be received through the fontanelle, or in adults

through a large parietal opening without accompanying fracture.

SYMPTOMS AND DIAGNOSIS.—The symptoms and results of the wound vary according to the age of the patient, seat, and extent of the injury, septic conditions of the weapon and wound, etc. In some cases the symptoms are very slight and much delayed, but more often are severe and promptly manifested, and are proportionate to the extent of the injury.

If the injury be moderate, headache occurs, with all the symptoms of encephalitis in course, followed by coma and death if not soon relieved. The most valuable symptoms tending toward such relief are the localizing symptoms, which may often reveal a hidden injury. If the injury involve the structures at the base of the brain involving the respiratory tract, immediate death must ensue. If the anterior lobes and upper parts of the hemispheres be injured, but slight symptoms may occur. Twitching of the muscles and epileptiform fits are symptoms of cerebral laceration, and those complicating stertor or alternating with it make the diagnosis clear.

In those cases in which no external wound exists we may suspect laceration if we find that the ordinary signs of compression or concussion are associated with symptoms that do not ordinarily present themselves in those conditions when uncomplicated, such as contraction of one pupil, dilatation of the other, or an alternation of these states with convulsive twitchings of the limbs, hemiplegia of one side, or paralysis of one arm and the opposite leg, with perhaps involuntary spasmodic movements of the other members (Erichsen). In laceration of the brain without compression the pupils are contracted. When laceration and compression are both present,

one pupil may be dilated and the other contracted; or both will be dilated or contracted according to the predominance of the symptoms of compression or of laceration. These irregular symptoms accompanied by much coldness of the surfaces, slow pulse, and depression of vital power indicate cerebral laceration. Paralysis due to a cerebral lesion is always manifested on the opposite side of the body, but not necessarily opposite to that on which the blow was received, as the injury may be from *contrecoup*.

Saccharin diabetes is an occasional consequence of injury to the brain, and the location is usually referred to central part of the medulla oblongata and the floor of the fourth ventricle. Blindness may result from injury to the optic nerves at any part; ptosis and strabismus in different direction result from injury to the third, fourth, or sixth nerve. The seventh nerve most commonly suffers, being not uncommonly torn across in fractures of the petrous portion of the temporal bone, either in its facial or auditory portion, producing either facial paralysis or deafness. Injury to the eighth nerve is rare, and patients rarely survive who give evidence of the lesion. Motor aphasia points to a wound above and in front of left ear; word-blindness, or apraxia, points to an injury above and behind the ear; hemianopsia indicates a wound of the cuneus; paralysis of face, arm, or leg would point to their respective cortical centres as the seat of injury.

A final summary of all the evidence at command in reference to traumatic cerebral oedema serves to confirm the conclusions already advanced: 1. That traumatic cerebral oedema can find no place as a pathological or clinical entity. 2. That it is primarily the inevitable sequence in time of that complex of pathological conditions which we designate contusion. 3. That inasmuch as

contusion of the brain and its meninges is most commonly met with as a concomitant lesion to the more macroscopical lesions designated hæmorrhage and laceration, the primary seat and extent of its accompanying œdema will be largely fortuitous. 4. That in the rare instances in which the application of a traumatizing force is expended in the production of a local contusion of the brain-cortex or its meninges the brain is of itself abundantly able to rid itself of the œdema through its venous channels. 5. That in the remaining cases in which the contusion is primarily extensive in the cerebrum, or when it affects the cerebellum or bulb, the factors which enter into the mechanism of the production of the œdema are such as to preclude the possibility of operative relief. 6. That contusion can, *per se*, easily cause death. 7. That death in such cases results from anæmia of the bulb. J. W. Courtney (Boston Med. and Surg. Jour., Apr. 27, '99).

PROGNOSIS.—The danger of wounds of the brain is greatest and most immediate in injuries of the base, of the pons, and of the *crura cerebri*; it is least and most remote when the seat of the lesion is in the upper and anterior part of the hemispheres, in some cases there being no positive indication of any injury when so located. Unless the pons or medulla have been wounded, the patient seldom dies at once. Children often bear extensive injuries to the brain, and even considerable loss of brain-substance without immediate or remote effects of serious nature. As a general rule, the younger the patient, the greater the chance of recovery. The prognosis is usually more favorable in men of the laboring classes.

TREATMENT.—In these injuries to the brain the head should be clean shaved, and the parts should be washed, scrubbed, and cleansed with an antiseptic solution. All foreign bodies on the outside should be washed away or re-

moved with forceps. Foreign bodies, fragments of bone, etc., which have entered the brain should be removed and the depressed bone elevated. Disinfection of the brain-cavity and arrest of hæmorrhage by pressure, hot water, or ligature should follow. The dura should be sutured, if not too much lacerated, missing portions being covered in by a portion of the pericranium. The wound should be drained, rubber tubing being preferable, the flaps of scalp replaced and sutured, and a generous antiseptic dressing applied. If secondary abscess appears, and it should be carefully watched for, the pus should be evacuated as soon as detected.

Gunshot Wounds of the Head.—These injuries may involve the integrity of the scalp, the skull, or the brain. The serious nature of these lesions is not always appreciable at first sight. A glancing shot may have injured apparently the scalp alone, while in reality the skull may have suffered such injury that necrosis of the bone will follow, fracture of the internal table, perhaps with splintering or depression; or even the brain and its membranes may be at once or later involved. In these injuries the scalp often sloughs extensively, the tissues being devitalized by the "energy" of the ball; perforation or deep penetration is not the only means by which the energy of a projectile is measured, for its disruptive, tissue-destroying powers are of equal importance. In other more serious cases extensive injuries of the brain and skull may result.

Experiments on animals have shown that a bullet in its passage through the brain does not leave a smooth track, but that it leaves, behind it, tears which radiate out from it. The gray substance is usually more torn than the white; this suggests that the latter is firmer. Tillmanns (Phila. Med. Jour., May 7, '98).

When gunshot wounds involve the brain they may be either perforating or penetrating; perforating, when the missile passes entirely through the head, and penetrating when the missile enters the brain, but does not emerge. The severity of the injury to brain or skull varies within very wide limits. The wound of exit is always larger than that of entrance; this difference is more marked in the skull than in the soft parts. In a perforating wound of the skull the wound of entrance in the external table may be very small, while the inner table may be severely fractured; at the wound of exit the outer table usually suffers most, and the entire opening will be much larger than the wound of entrance. Besides the presence of the missile, there may be fragments of hair, bone, etc., present along the tract of the wound, and more or less hæmorrhage and infection as explained in WOUNDS OF THE BRAIN.

The symptoms are similar to those given under WOUNDS OF THE BRAIN and FRACTURES. Localizing symptoms, however, may be absent more or less completely, owing to the far-reaching effects of this class of injuries.

TREATMENT.—In many cases rigid protection of the wound against infection may render further interference unnecessary. Balls and bullets often become encysted. If operation be determined upon, the entire scalp should be shaved and disinfected (see **TECHNIQUE OF INTRACRANIAL SURGERY** in this article). The entire track of the wound should be disinfected from entrance to exit or to the certain or probable site of the ball. If any serious hæmorrhage be present, the wound of entrance or the wound of exit or both must be freely enlarged with the rongeur forceps or the trephine, and the vessels secured by liga-

ture, by pressure, or with hæmostatic forceps. The bullet or missile must be removed if possible, a counter-opening being made, if necessary, for this purpose. Secure free drainage; if need be, by a counter-opening; the drainage-tube may, for this purpose, have to traverse the entire brain. Antiseptic dressings should be applied, and treatment continued upon the general principles involved in cerebral surgery. The above line of treatment is that advised by Keen, briefly stated. Several devices have been introduced to facilitate the finding of the bullet, etc. Girdner's "telephone probe" is an ingenious instrument in which one end of the probe is attached to a telephone receiver which may be fastened to the ear. If the probe touches the ball, it will indicate it by a grating sound. If the ball is not over $2\frac{1}{4}$ inches from the surface, Girdner's "induction balance" may also indicate its location, and the counter-opening may be made close to the ball.

Thirty-two observed cases in which the bullet had been allowed to remain *in situ*. Eight of these died shortly after the lesion with progressive brain symptoms. Two died at a later stage, of abscess in the frontal lobe; and two others, of purulent meningitis. One case was lost sight of. The remaining nineteen recovered; they either presented no symptoms or were unconscious for a short time and suffered later from localized paralysis or cramps. In a limited number there was paralysis on the opposite side of one hand or arm, with subsequent contracture. In the group of cases which recovered with cerebral symptoms, there can be no doubt that the bullet had traversed and destroyed brain-tissue, and had become capsulated. That such capsulation can take place is proved by the Roentgen photographs. Von Bergman (Berliner klin. Woch., May 2, '98).

Case of a man who shot himself in the head. The bullet passed through the

skull, and perforating both hemispheres. The remarkable thing about the case was that the patient showed no losses of function. Lindsay (*Jour. Amer. Med. Assoc.*, Jan. 23, 1904).

Morgan, of Indianapolis, has devised what he calls a "trajector" for determining the course of a bullet in gunshot wounds of the skull. It is composed of a solid steel bow (*A*) in the end of which is a movable rod (*BF*). The opposite end of the bow is supplied with a triangular groove (*C*) on its under surface, so that it will adjust itself to the

of an aluminium shaft, 12 inches long, tipped with large conical ends of various sizes. It is so light that when allowed to enter the track of the ball vertically, it will do so by its own weight and will not make a false passage.

Finally, the value of the Roentgen rays, or x-rays, must not be forgotten. A series of sciagraphs may be taken, different portions of the skull being exposed in succession. Reid's base-line marked by a piece of lead wire will show in the sciagraphs.



Morgan's trajector. (*Indiana Medical Journal.*)

searching probe (*E*). The probe is allowed to gravitate along the track of the bullet until it is arrested; the groove of the trajector is then applied to the probe, and the movable rod on the other end is moved in until it comes in contact with the skull (*F*). This will represent the point where the bullet impinged upon the skull opposite the point of entrance, in case it has passed through the brain, and therefore the point for counter-trephining.

Fluhrer's aluminium probe consists

In regard to probing the brain, there can be no excuse for thrusting a probe in any direction through normal tissue in the search for a ball. If the probe be of proper size and shape, it will give a definite and readily appreciable resistance before making a false passage. An hemispherically-tipped probe, of $\frac{1}{4}$ -inch diameter, requires from $2\frac{1}{2}$ to 3 ounces weight to produce penetration and $1\frac{3}{4}$ to 2 ounces to cause it to pass between the convolutions. This size tip sufficient to follow up any ball from 32 calibre upward, with a resistance to penetration that a very unskilled touch ought to

appreciate. A $\frac{3}{16}$ -inch probe requires from 1 to 2 ounces of weight to cause penetration of sulci or cerebral tissue, and will answer for small rifle-balls; but both should be porcelain tipped, and be carried by a small aluminium shaft, to give least possible weight to probe and least lateral friction to collapsed canal. Ruth (Jour. Amer. Med. Assoc., Aug. 20, '92).

As a method of precise localization and measurement by means of Roentgen rays, the following procedure is laid down: Two wires at right angles to each other are placed upon the photographic plate, film, or paper. The Crookes tube is then placed with its anode at a measured distance from the plate and exactly perpendicularly to where the wires cross. The tube is fixed in a holder which slides in one plane. Further, one of the cross-wires must be in exactly the same plane as that in which the tube is to be displaced. The wires being painted over with some pigment, the part to be photographed is placed on the plate, and carries with it a mark of the cross-wires. The tube is then displaced to a measured distance to one side of the perpendicular and an exposure given, then to a corresponding point on the other side of the perpendicular and another similar exposure given. The resulting negative shows double images from the two different points of view. A further precaution is necessary, viz.: to mark one quadrant of the plate and the corresponding quadrant on the patient's skin.

The negative—having been developed, fixed, and slightly washed—is at once placed on a horizontal stage illuminated from below by a suitable reflector (an arrangement similar to a retoucher's desk). The negative may be placed with the gelatin surface upward, or downward if the glass is not too thick. In the case of celluloid films it is most convenient to place them downward. The negative is adjusted so that a perpendicular dropped from a notch in a horizontal scale falls upon the point where the shadows of the wires cross. On each side of it another notch is made at the exact distance and height that

the anode of the Crookes tube occupied in the two exposures. A fine silk thread is then passed through each lateral notch, and a small leaden counterpoise is attached to one end of each thread, while the other is passed through the eye of a fine needle. The needle is weighted with lead so that its eye lies flat on the surface of the negative. In short, these two silk threads represent the path of the x-rays, so that if each needle be carefully placed upon a corresponding point in each shadow it follows that the point where these threads cross marks the position occupied by the corresponding part of the actual object. Further, its distance can be measured perpendicularly from three planes: from the horizontal which gives its depth, and from the two planes represented by the shadows of the cross-wires. By measuring any other desired corresponding points the precise size, position, and direction of the object can be determined, and remembering that the cross-wires have left their mark on the patient's skin we can at once from these data give the surgeon all the information he can possibly desire. James Mackenzie and W. S. Hedley (Lancet, Oct. 16, '97).

Study of 132 cases from Braumann's clinic in Halle. The indications for primary trephining in cases of penetrating wounds of the skull are: (1) where the bullet is situated very superficially; (2) where there is profuse hæmorrhage from the art. mening. media or other branches; (3) where symptoms of irritation appear soon after the injury, showing the lodgment of the bullet or of a splinter of bone in the motor centres. Wiernuth (Archiv f. klin. Chir., B. 60, H. 2, 1900).

F. G. Winter, of Brooklyn, has devised an instrument which combines the principles of Morgan's tractor, Fowler's pressure probe, and Girdner's telephone probe. The tractor consists of a solid bow of aluminium with bulbous tip on the distal end; the proximal pole is hinged to a small steel plate, which is rabbeted to fit a groove on the sliding handle of the pressure-gauge probe. The portion of stem of probe projecting

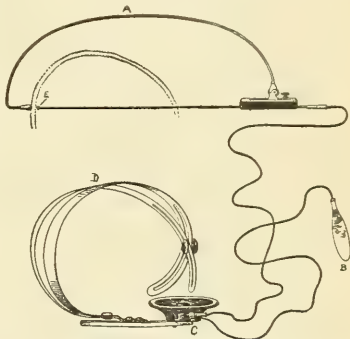
beyond handle is for attachment of the telephonic apparatus. Instead of hand-receiver, a head-receiver may be used, leaving both hands free. (Girdner's telephonic apparatus consists of receiver, conducting wires, bullet probe, and mouth-piece.)

Wounds of the Sinuses of the Brain.

—The superior longitudinal or the lateral sinuses are occasionally injured during the course of operations, but more often in cases of severe fracture of the skull, usually of the compound variety. When a sinus is injured the extravasation of blood is so rapid and copious that the patient may die in a few minutes from shock, as rapid loss of blood from the brain is more fatal than a like loss in other situations. Hence the necessity for great care when operations are made in the neighborhood of the sinuses. In using the trephine the edge of the instrument should be placed at a perfectly safe distance. The dura may be separated and the sinus entirely detached from the skull by using the dural separator, or a grooved director or probe, and then the finger. The rongeur forceps may then be safely used to enlarge the opening made by the trephine. If incision or exsection of a portion of the sinus is necessary, the sinus may be exposed and ligated on both sides of the proposed incision or exsection. If the sinus be opened accidentally during operation or by fracture, lateral ligature and suture of the sinus may be employed; instant packing with iodoform gauze will, however, arrest such hæmorrhage. It has also been suggested that the margins of the wound be secured by one or more pairs of hæmostatic forceps, which may be removed on the second or third day.

Conclusions regarding wounds of venous sinuses of brain are: 1. Wounds of the venous sinuses of the brain should

be classed as dangerous injuries, being followed by a high mortality, from external or intracranial hæmorrhage or septic infection. 2. They are especially liable to infection, resulting in septic thrombus and pyæmia; therefore the greatest care should be taken to render them aseptic and preserve them in that condition. 3. The most satisfactory and generally available method of treatment consists in controlling the bleeding by aseptic gauze packing. 4. Ligation of the venous sinuses presents definite dangers in itself; is only available in certain wounds, where a free exposure of the injured sinus is possible; and cannot be employed with advantage in ordinary



Winter's apparatus for locating bullets.

accidental wounds of the sinuses. 5. The application of a lateral ligature to a wound of a sinus is less difficult and dangerous than ligature of the sinus, but is only applicable to small wounds. 6. Suture of sinus wounds is a valuable procedure in a certain class of cases, namely: small wounds which can be freely exposed. 7. Forceps pressure is also a ready method of controlling hæmorrhage from wounds of the sinuses, but possesses no distinct advantages over some of the other methods, and its employment is accompanied by certain dangers. H. R. Wharton (*Annals of Surg.*, July, 1901).

Report of a case of a cadet who shot himself in the forehead, the bullet passing through the skull in two places. He

never lost consciousness. Blood escaped from his nose, and the wounds of exit and of entrance permitted the escape of blood and broken bits of brain-tissue. Under anæsthesia the wounds were cleansed, sutured, and packed with gauze, the skin being almost closed over it. The wounds healed well. Three weeks later paralysis of the right facial nerve was noted, but this quickly disappeared. Six weeks afterward he was perfectly well, though from 60 to 80 grammes of brain-substance had been lost. Diwald (Wiener klin. Wochen., Jan. 23, 1902).

Foreign Bodies in the Brain.—As the result of traumatism, bullets, knife-blades, arrow-heads, umbrella-ferrules, nails, wire, splinters of wood, pipe-stems, fragments of bone, clothing, hair, etc., have been found lodged within the cerebral substance. The symptoms caused by the presence of foreign bodies in the brain are treated of in **WOUNDS OF THE BRAIN** and **GUNSHOT WOUNDS**. The following course of treatment is advised: Gentle probing or the Roentgen rays to detect the presence and location of the foreign body, no force being used. Remove the fragments about the wound of entrance and thoroughly disinfect the latter. Avoid prolonged and elaborate search should the bullet or other foreign body be not readily found. Employ drainage and dress antiseptically. If there be any bleeding, this can be controlled by a tampon of iodoform gauze, which will at the same time assist the drainage. After applying the antiseptic dressing apply cold to the head. If symptoms of encephalitis develop and are not controlled by careful irrigation and dressing, open the jugular vein and bleed the patient. Absolute rest and quiet should be insisted upon. The diet should be light and nutritious, stimulants being added, if necessary.

Fungus, or Hernia, Cerebri.—When a

laceration of the brain and dura mater communicates with a fracture of the skull, it is usually found, especially in children, that a dark-brown or bloody fungous-looking mass of cerebral matter protrudes from the wound. This protrusion takes place at any time—a few days to several weeks—after the receipt of the injury. It has been noticed by Guthrie, and confirmed by others, that hernia cerebri is more likely to take place through small than large apertures in the cranial bones. After its appearance the tumor increases quite rapidly to the size of a hen's egg, or even larger, and pulsates synchronously with the brain. In composition and structure it varies. Sometimes it is composed chiefly, if not entirely, of extravasated blood; but the true fungus cerebri consists generally of connective-tissue growth (neuroglia), rarely containing much true brain-substance, but may consist of softened and disintegrated cerebral matter, infiltrated with lymph and blood. Under the base of the tumor the softening and red discoloration of the brain extend for some little distance. There may be more or less discharge from the fungus, and escape of cerebrospinal fluid from the interior of the ventricles. It is apt to bleed.

In this affection the mental condition of the patient may not be much disturbed at first, although there is generally evidence of cerebral irritation. In many cases stupor speedily comes on, however, and death eventually occurs from encephalitis followed by coma consequent upon the development and increase of intracranial inflammatory effusion. In other cases cicatrization of the surface, with retraction of the tumor, takes place and recovery follows.

As a prophylactic measure the suggestion made by Keen may be carried

out, that whenever removal of the dura or brain-substance is rendered necessary during the course of operation, a piece of the pericranium should be entirely detached from the under surface of the scalp-flap, turned upside down so that the osteogenetic surface shall be uppermost, and secured to the dura by a few interrupted sutures.

TREATMENT.—The treatment of this condition is not entirely satisfactory. If the tumor be cut off by the knife or destroyed by the cautery, it generally sprouts out anew, though in rare instances removal has not been followed by reproduction. The best results generally follow the use of antiseptic dressings changed once or twice daily, healing taking place by granulation. If it heals slowly, skin-grafting may be resorted to. As soon as cicatrization has been completed there is a sudden subsidence, so that, in the place of a bulging mass, there is a marked depression, which is permanent, and may amount to as much as one and a half inches. Pressure by dressings or sponges, though sometimes useful, must be abandoned if followed by symptoms of intracranial pressure or by convulsions.

Daily irrigations with hydrogen dioxide and dressings of iodoform gauze, with systematic compression, used in case of hernia cerebri. Diminution in size noticed after first week. At end of ten weeks no evidence of any abnormal growth. T. S. McMullan (Med. Record, Aug. 27, '98).

Surgery of the Lateral Ventricles.—

A number of cases have been reported in which the lateral ventricles have been opened by injury, 5 cases from simple cranial fracture occurring in children, of whom 3 recovered. There are also recorded 7 cases of compound fracture with injury of the ventricles, 4 of which recovered, and 2 cases of primary rupture of the ventricles by compound fract-

ure, both of which recovered. In fungus cerebri a communication with the lateral ventricles is sometimes established, manifested by a continuous flow of cerebro-spinal fluid therefrom, in which recovery has followed. Moreover, Keen has shown that puncture of the lateral ventricles through the brain-substance can be done accurately, and that a drainage-tube may be introduced into the ventricles and remain several weeks without inducing encephalitis or meningitis, and that even irrigation of the ventricles from side to side after bilateral trephining can be done without discomfort to the patient. From these facts it follows that in cranial fractures involving the ventricles we should not consider the accident as necessarily fatal, but should employ the same antiseptic precaution methods and treatment as though the ventricles had not been involved, and with a reasonable hope of recovery.

If the ventricles are to be tapped, Keen advises the lateral route. A half-inch trephine opening should be made one and one-quarter inches behind the external auditory meatus and the same distance above Reid's base-line (an imaginary straight line drawn through the lower edge of the orbit and the meatus auditorius externus). Then the grooved director or a small tube (calibre No. 5 of French catheter scale, or a little larger) should be thrust carefully and steadily into the brain in the direction of a point $2\frac{1}{2}$ to 3 inches above the opposite meatus. If the lateral ventricle be of normal dimensions, says Keen, it will be reached at a depth of 2 to $2\frac{1}{4}$ inches, but if distended it will be reached at a less depth. The entry into the ventricle will be recognized by the instantly diminished resistance and by the escape of cerebro-spinal fluid, also.

Drainage, either by inserting a small bundle of horse-hair doubled like a hair-pin, with the rounded ends inserted first, and passed through the tube, or by carrying a rubber drainage-tube of the same size into the ventricles. Asepsis must be absolute, or the result will be necessarily fatal.

This operation has been done for the relief of acute hydrocephalus with promising results (Mayo Robson reports a cure); in chronic hydrocephalus several operations have been made, but without success. Further reports will determine the value of this operation.

Cerebral Contusions.

A contusion of the brain always accompanies any serious injury to the cranium. Such contusion can exist without necessarily having a fracture of the skull; but, on the other hand, a fracture of the skull is always accompanied by cerebral contusion.

Symptoms.—The symptoms of contusion of the brain, referring to loss of function, are characterized by their diffuse or generalized condition. Hence, they differ materially from those of compression, which refer absolutely to distinctly-localized lesions. Vomiting often occurs after the injury. Respiration is superficial, but may be deep and stertorous. Fever has been observed in contusion of the brain, especially in case of injury or irritation of the median portion of the corpus striatum, and the mesencephalon, such as the posterior corpora quadrigemina and the sensory nucleus of the fifth nerve (Kocher).

It has long been a mooted question whether contusion could always be differentiated from concussion of the brain by any special symptom. Clinically this does not exist. In a general way the symptoms of concussion, resulting from a lighter form of traumatism, produce

less material disturbance and are therefore more transitory, whereas in severe contusion the symptoms persist and are sometimes aggravated, because of the possibility of an encephalo-meningitis complicating the case. Loss of consciousness, partial or complete. Paralysis more or less complete of different portions of the body. A cold, clammy condition of the skin, a feeble, fluttering heart. After a few days these symptoms disappear gradually, depending upon the absorption of the extravasated blood. After recovery the patient may suffer for a time from vertigo, headaches, and loss of memory, in addition to a general debility and malaise.

Case of a boy, 15 years of age, who had fallen from a height on the left side of the head. He was never unconscious at any time, but aphasia with pain in the head gradually supervened, although vomiting never appeared. On the third day spasmodic cramps along the entire right side of the body commenced, but gradually disappeared.

On the seventh day motor aphasia was established, with difficulty in writing and general disturbance of the muscular movements of the right side, while the sensory function was unaffected. At this time paralysis of the right facial and hypoglossal nerves was observed, with pain and jerking of the right hand. Over the coronal suture there was a tender area, about the size of a shilling, which was slightly depressed.

Three days later the whole condition of the patient rapidly improved, and he began to speak as fluently and write as correctly as ever he did, while all spasmodic jerking and pain left him.

The writer could put no other construction on these remarkable circumstances than that a contused condition of the brain was the result of the injury which gradually brought about the paralysis by an effusion of blood from the median artery of the meninges that subsequently became absorbed as other hæmatoma. The rapidity of the recovery

in this case lends weight to the expression that many of the cranial operations performed are quite unnecessary, as they would recover more satisfactorily if left alone. Frey (*Med. Press and Circular*, Aug. 19, '96).

Case of fatal fracture of the skull in which there were severe central changes without cortical involvement and total absence of signs of contusion in the meninges and cortex. The symptoms were: Concussion signs with recovery after several hours; paralysis of the left arm and tongue with early incomplete paralysis of both legs; cystitis with peritonitis and hyperpyrexia. G. Hauser (*Deutsch. Archiv f. klin. Med.*, B. 65, H. 5 and 6, 1900).

Pathology.—Contusion does not necessarily bear a direct relation to the seat of injury. Bergmann maintains that when the traumatism has been applied over a large area, and violent enough to depress the skull, not only is there severe contusion, or laceration of the subjacent brain-structure, but the corresponding portion of the brain on the opposite side has likewise undergone considerable contusion, by the force's being transmitted through the brain, against the skull opposite the seat of injury.

The superficial layers of the brain are most likely to be affected, especially since the gray cortical substance is the most plentifully supplied with blood-vessels. In fractures at the base of the skull contusion of the brain exists mostly at the temporo-sphenoidal lobes. The occipital lobes are not so readily affected, on account of the protection offered them by the cerebellum. The following distinction exists between a spontaneous cerebral capillary hæmorrhage and that resulting from a contusion, viz.: In contusion the arachnoid is likewise a seat of hæmorrhage, owing to its share in the effects of the traumatism, while in spontaneous cortical hæmorrhage the meninges are not affected.

According to the violence of the injury will the character of the capillary hæmorrhage, destruction of tissue, and corresponding impairment of function vary. The hæmorrhage might be disseminated and punctiform, or more pronounced, giving a dark area with lighter boundary. Such a lesion as this, if examined microscopically, would give evidence of minute destruction of cerebral substance by the blood disseminated in the tissues.

A blow to the head produces a momentary increase of intracranial tension and consequent compression of the brain as a whole.

The effect of this compression would be to cause an interference with the blood-supply to the entire brain, and this is sufficient to account for the primary symptoms of cerebral concussion.

The so-called syncopie death after severe concussion is produced by a paralysis of the respiratory centres, the cardiac centres remaining intact. This fatal result may in many cases be prevented by the prompt institution of artificial respiration. S. P. Kramer (*Annals of Surg.*, Feb., '96).

Contusions may be limited to the meninges, or to the brain, or may involve both; there is no destruction of tissue and only slight extravasation of blood. When recovery occurs it is by absorption, not cicatrization. D. W. Day (*Northwestern Lancet*, Apr. 15, '98).

If left untreated such a condition would tend toward a process of absorption and gradual restoration of impaired function, provided there be no infection, either directly, because of the traumatism, or indirectly, on account of a latent diathesis which could, perhaps, implant itself on this locality. The minute hæmorrhages become encysted and disappear. In other words, should there be no fracture leading to a possible infection from without, or lurking diathesis leading to an infection from within, these

contusions of the brain rarely lead to supuration or violent encephalitis. (See ENCEPHALITIS and CEREBRAL ABSCESS.)

Prognosis.—The prognosis depends altogether upon the presence or absence of infection and the general health of the patient. Should no disturbance be feared from these two causes, a gradual recovery is to be anticipated. On the contrary, should the destruction of brain-tissues have become infected, we may expect encephalitis and its results.

If the patient survive twenty-four hours recovery is likely to take place, so far as the direct effects of the concussion are concerned. Hutchinson (Med. Press and Circular, Dec. 20, '93).

Treatment.—Since the danger from contusion of the brain results from a permanent destruction of function, on the one hand, and infection on the other, the treatment will be directed toward obviating the possibility of these accidents.

Our guide will, therefore, be the violence of the symptoms. Should these indicate no absolute gravity from loss of function, such as complete unconsciousness, great depression, and paralysis, the reaction which the contusion necessarily creates in the cerebral tissues must be met as follows: Complete rest; head slightly elevated. The depression must be relieved by hypodermic injections of strychnine sulphate, $\frac{1}{40}$ grain every three hours until reaction takes place in the pulse. Hot-water bags are applied.

As soon as the patient is able to swallow, he should be given purgatives, which will, by depleting the circulation, promote the absorption of effused serum following the contusion of the brain.

In the after-treatment of injuries of the cranium the main points to bear in mind are antisepticism and rest.

It must be premised that, so far as any wound is concerned, that has been treated by one of the methods of modern asepticism; but for general antisepti-

cism one of the first considerations is to clear out the digestive tract, and for that purpose nothing is better than the calomel purge. Whatever the nature of the injury, as soon as reaction has set in, the intestinal tract should be cleared; and, if the lower bowel is loaded, a stimulant purgative enema is of great use.

The bladder must be looked after, and, if necessary, the urine drawn off. If the temperature should run high, and the skin be very hot, and the patient be very thirsty, diaphoretics may be administered and fresh lemonade or some cooling mineral water allowed, but nothing else. Very light dietary of great importance.

In some cases, especially where brain has been lacerated, small doses of morphine subcutaneously are very useful.

The head should be kept as cool as possible, by shaving or cutting the hair short, and by evaporating lotions or by ice; it should also be rested on a hard pillow, and is best kept well raised, and the room should be kept darkened. Chauncey Puzey (Liverpool Medico-Chir. Jour., July, '96).

The old classification of concussion and compression of the brain no longer attracts the attention of the surgeon. The phenomena connected with concussion are often transitory, usually not serious, and involve as a whole no important lesion of the brain. Concussion has to do with a disturbance of the fluid equilibrium, and is usually of momentary duration. If the concussion is severe, spasm of the vasomotor system occurs, and the condition simulates surgical shock.

Frankel maintains that without consciousness no concussion can occur, a fact which is of great importance in medico-legal cases. For example, if a person falls in consequence of syncope, he will not suffer from concussion of the brain. If he falls while conscious he is certain to receive a concussion of the brain if he does not sustain a more serious lesion. In the former case he may suffer from cerebral compression, or cerebral pressure according to the violence and extent of the injury. In

the latter case he may escape both of these conditions, and suffer from simple concussion, or he may escape any concussion and suffer from a more serious injury such as cerebral compression or cerebral pressure. Concussion is a condition found in fractures of the skull as well as in trauma without fracture. The manifestations present vary greatly with the individual. The writer has made an observation from the study of innumerable cases of concussion, that as far as he knows is original. The observation is that the more highly the nervous system is developed, the more sensitive the patient is, the more highly the intellectual faculties are cultivated, the greater the degree of concussion following head injuries. Children may fall from great heights, and if not killed outright, may rapidly recover. Frederic S. Dennis (*Medical News*, March 21, 1903).

Should there be the slightest abrasion or wound of the scalp, even if unaccompanied by fracture of the skull, the strictest antiseptic precautions should be preserved, lest any infection from without provoke a meningitis.

Case of white girl, 2½ years old. A large farm-bell, on a post twenty feet high, fell, striking her head on the right side in front of the motor region. The bones were driven into the brain, to the depth of one and one-half inches, making a large jagged wound in both the dura and brain. There was not much hæmorrhage. Considerable bloody brain-tissue came away when the wound was washed out. The ragged edges of the dura were trimmed smoothly, but could not quite be brought together. All depressed bone was elevated or cut away. A drainage-tube was passed down to, but not into, the wound of the brain. No fever and an uninterrupted recovery. David Y. Winston (*Can. Lancet*, Dec., '97).

Study of cases of injuries to the cranium. The gravity of such cases should never be judged from the extent of the external injuries. The chief elements in such cases are the concussion and compression of the brain and the presence of intracranial hæmorrhages.

In children, as a rule, the injuries to the cranium are less grave in proportion, because in them the metabolism is more active and injuries are more rapidly repaired; and, besides, their sutures are not so firmly united, so that the head has more resiliency. Stella (*Gazzetta degli Osped. e delle Clin.*, Dec. 27, 1903).

If the symptoms are much aggravated in a few days, showing cerebral œdema, and consequent autocompression of the brain against the skull, the indication then is to trephine over the seat of the injury and if necessary incise the dura for the relief of intrameningeal pressure.

The trephined opening may be enlarged by means of the Rongeur forceps, if the size of the contused area warrant the procedure; it is remarkable how much drainage of serum and possibly cerebrospinal fluid takes place under the circumstances, followed by gradual disappearance of the pressure symptoms. The subsequent treatment would then be as in less aggravated cases.

Cerebral Concussion.

Symptoms.—It is very difficult to establish clinically a distinction between concussion and confusion of the brain. However, concussion conveys the idea of the brain, as a whole, having been violently shaken under the effect of a traumatism, resulting in a disturbance of function, without any appreciable lesion of the brain-substance. The boundary between the two conditions must, therefore, be more imaginary than real.

In the mildest grade of concussion there is a brief diminution of the blood-pressure in the part; its tension is temporarily lowered. If the violence is somewhat greater, then there is superadded to the former condition a disturbance of the cellular constituents composing the surface of the brain. A jostling or displacement of the molecular elements of these cells, even though it be microscopically minute, must suffice

to induce functional derangement. If the violence is still greater, then, besides the abolition of the thinking faculty, the cardio-pulmonary functions are disturbed, depending, doubtless, on the lesions of the centres at the base of the brain. In the still-higher grade the functions of life permanently cease at once, or within a few minutes after the receipt of the violence. Lane (*Jour. Amer. Med. Assoc.*, July 14, '94).

Concussion, due to a single blow or to repeated blows, is accompanied by the same effects upon the nerve-centres. If differences are manifest at the moment of the blow they can be readily explained and simply confirm this general law; the clinical condition is identical in the two cases. The analogy is visible even in the minutest detail that there is nothing to be added to the bulbar symptoms. Violent concussion produces great rapidity of heart-action. Nerve-centres under the influence of anæmia suffer the same changes as under the influence of concussions.

In conclusion, two facts are to be considered: first, the action of the violence upon the nervous centres; second, the vascular change produced by the effect of such violence upon the vessels. Where the latter is slight, great violence may do much less harm than a light blow under reverse circumstances. Death may even ensue without any actual discoverable lesion. August Polis (*Revue de Chir.*, Aug., '94).

The symptoms of concussion merge into those of contusion of the brain. In a word, they are milder and more transitory. There is a dazed condition, at the worst amounting to semiconsciousness, but at all times the condition is one from which the patient can be aroused on loud command or address. The pulse is rapid, there is general irritability and jactitation, deep sighing, and cold, clammy skin.

Miles has found from experiments that there is a temporary anæmia of the brain in concussion. This is the reflex result of the stimulation of the restiform

bodies, and perhaps other important centres in the region of the bulb. These parts are stimulated by the cerebro-spinal fluid which rushes through the aqueduct of Sylvius, the foramen of Magendie, and the subarachnoid space to that of the concussion when a severe blow is dealt over the head. Hence this cerebro-spinal fluid will disturb the equilibrium of the ultimate nerve-cells throughout the nervous system.

Study of spinal and cerebral concussion. Conclusion that the cerebral commotion is caused by a tearing of the connections between the gray and white matters of the brain, and is, in the majority of cases, complicated by capillary apoplexies. The lesions are thus dependent on the different specific gravities and on the different stabilities of the blood and of the gray and white matters of the brain. Because of the weight of the blood and white substances, they possess, when set in motion, more energy than the gray matter and cerebro-spinal fluid. The result is a tearing between the white and the gray matters, caused by destruction of the balance between the same; also there is a rupture of the finer capillaries, due to the blood being forced against their walls. Tillman (*Archiv f. klin. Chir.*, B. 59, H. 1, '99).

Treatment.—The treatment resolves itself into meeting the indication, according to the symptoms of the particular case, as described under CONCUSSION.

Latterly it has been suggested to abandon the term "concussion" for that of "laceration" of the brain, inasmuch as it has been ascertained that minute lesions disseminated throughout the brain can be observed, where formerly there was supposed to be no appreciable lesion. (Phelps.)

In the milder cases of concussion of the brain scarcely anything is to be done further than to make the patient lie down a short time, with possibly a little cool water or cold compresses to the forehead. In severer cases the patient is to

be put to bed with cold cloths or cold coil to the head, milk diet for a day or two, bowels kept open, absolute quiet enjoined, and, if needed, bromides or small doses of morphine given for rest and sleep. David Y. Winston (Can. Lancet, Dec., '97).

A very important factor in the after-treatment of cerebral concussion is to order the patient absolute and prolonged rest, whether the concussion has been severe or only slight. He should abstain from all business or worries of any kind. The best plan is for him to go down to a little country-place, and avoid all excitement. Health resorts are not calculated to afford the mental rest which is so needful. Charles Stonham (Clinical Jour., July 18, 1900).

See also CEREBRAL ABSCESS, ENCEPHALITIS, and FRACTURES.

HEAT-STROKE. See INSOLATION AND HEAT-STROKE.

HEMIPLEGIA. See various disorders in which it occurs.

HEPATITIS. See LIVER, DISEASES OF.

HERNIA.

Definition.—The term hernia is used to denote the protrusion of one or more of the abdominal viscera, and is synonymous with the ordinary term "rupture."

Varieties.—If the protrusion occurs through openings in the abdominal wall which, normally patent in foetal life, through some defect in development have failed to close at birth, the hernia is said to be *congenital*. The protrusion may also occur at other points in the abdominal wall, by nature weaker than elsewhere, namely: in the femoral region, in the inguinal canal, and at the umbilicus. In these cases the rupture may be said to be *acquired*.

In addition to these varieties we have ventral hernia following abdominal in-

cisions or accidental wounds. This variety is frequently known as traumatic. A hernia takes its name from the site of the opening through which it protrudes. The common forms are: *inguinal, femoral, umbilical, and ventral*. The rare forms: *diaphragmatic, lumbar, obturator, ischiatic, pudendal, perineal, properitoneal, and retroperitoneal*.

Distinction is often made between *external* hernia, including all the varieties above mentioned, and *internal* hernia, by which latter is meant the protrusion of a viscus through some anomalous pouch in the peritoneum.

Surgical Anatomy.—A hernia consists of a sac, the coverings of the sac, and contents. The sac is always a prolongation of the parietal peritoneum; it varies in size and shape according to the stage of the hernia. At first it is merely a pouting or bulging into the hernial orifice; narrow at the end, wide at the base. As the hernia extends and emerges from the orifice, the sac is elongated, and from the pressure of the contents the lower portion becomes globular or pyriform in shape. The narrowest part of the sac is called the neck, and the external, or distal, portion is called the fundus. A sac formed in this way—namely, by a gradual pushing forward of the parietal peritoneum—is said to be acquired, while a congenital sac is preformed, the protrusion occurring in the open tunica vaginalis or through the patent navel. A congenital hernia, while it may appear late in life, is dependent upon conditions which existed at birth.

The writer, in opposition to the currently accepted views, holds that all, or almost all, inguinal hernias are congenital—*i.e.*, that there is a pre-existent sac formed by a patent or partially patent funicular process. Among his reasons are: (a) That such congenital inguinal hernia are known to occur,

the protruded viscera actually lying in the tunica vaginalis; (b) that in every oblique inguinal hernia there is a well-marked neck; (c) that many inguinal hernias of considerable size appear suddenly—i.e., the sac is already there to receive them; and (d) that most infantile inguinal hernias, instead of being of the so-called congenital form into the tunica vaginalis as one would expect, are exactly like those occurring in adult life. If the author's view is correct, it follows that every case could be certainly cured by efficient removal of the congenital malformation. In the future radical operation will be the rule, and the truss the exception, especially in adults. In children there is no doubt but that a truss can often bring about an obliteration of the patent funicular process, and consequent cure. But after the second year a truss seldom cures. Deanesly (Brit. Med. Jour., June 27, 1903).

Adhesions may occur between the sac and its contents. The sac may become greatly thickened and opaque,—usually owed to the irritation of an ill-fitting truss,—and may undergo calcareous or malignant degeneration. Certain hernias are said to have no sac,—as, for instance, hernia of the bladder, sigmoid flexure, or cæcum. This is not entirely true; a sac exists, but the peritoneum does not completely surround the viscus.

The coverings of the sac are made up of the different layers of tissue outside of it. These, of course, vary according to the site of the hernia. An accurate knowledge of these layers is becoming more and more necessary to the surgeon, owing to the increasing importance given to modern methods for radical cure. (See Colored Plate.)

Every viscus, except the pancreas, has been found in some variety of hernia.

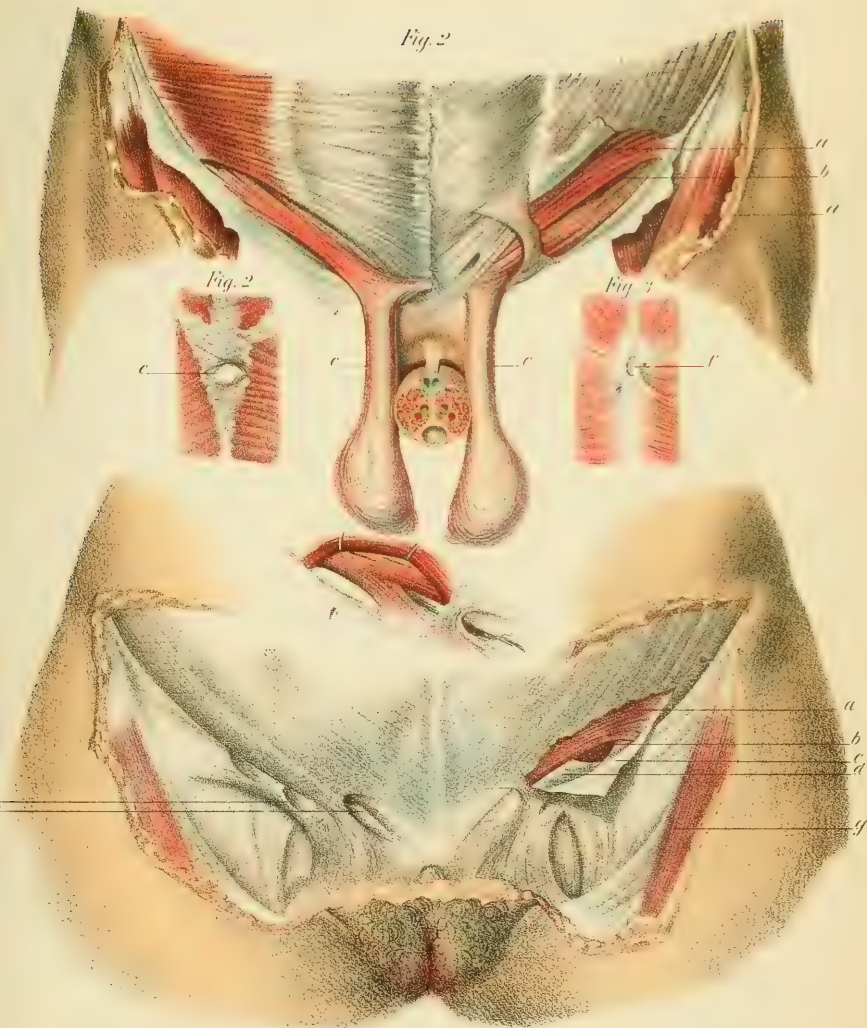
Three cases of ovarian hernia. Both of the first two cases, in children, were evidently congenital. The third case, the patient a woman of 40 years, was pregnant for the ninth time, had a pain-

ful tumor in the right inguinal region, which had existed nine years, during which time she had suffered from gastric disorders and constipation. At the operation the sac was found to contain the right tube and ovary. These cases all gave a percussion-note over the lump instead of the intestinal tympanic note. Quaddlieg (Münchener med. Woch., May, 1901).

Review of 180 cases of hernia of the urinary bladder collected from literature and a report of a personal case. It is mainly due to direct traction upon the organ by the hernial mass, or on the sac during operations for radical cure. It is sometimes possible during operation to recognize and avoid injuring it, especially if after one hernial sac has been found any structure resembling a second sac is regarded as bladder, until examination will have shown that it is not. Immediate suture with two layers of catgut and closure of the hernial wound by Bassini's method is the best step, if the bladder is injured. A small drain must be left leading to the bladder suture-line. It caused death in about 10 per cent. of the hernia cases which it complicated. W. S. Cheesman (Med. Record, June 22, 1901).

The contents are usually made up either of intestine or omentum, or both. If the hernia is reducible, the bowel and omentum present a normal appearance; but if irreducible and the hernia of long duration, numerous pathological changes are likely to occur. The omentum becomes thickened and adherent to the sac, usually at the neck, or to the bowel, if that be present. A small amount of serous exudate is not infrequently present in an irreducible hernia. If the hernia contains omentum alone, it is called an *epiplocele*; if bowel alone, an *enterocoele*; if both are present, *entero-epiplocele*.

Etiology.—About 25 per cent. of persons with a rupture give a family history of hernia; while 40 per cent. are ruptured before the age of 35, 60 per cent. after that age.



Surgical Anatomy of Inguinal Hernia.

Fig. 1. *a*. Internal Oblique. *b*. Internal Ring. *c*. Spermatic Cord. *d*. Sartorius Muscle.
 Fig. 2. *e*. Internal Aspect of Abdominal Orifice.
 Fig. 3. *f*. Internal Aspect of Permeable Region in Abdomen.
 Fig. 4. *a*. Internal Oblique. *b*. Internal Ring. *c*. Fascia of External Oblique. *d*. Transversalis fascia.
e. Crural Arch and Ring. *f*. External Ring. *g*. Sartorius Muscle.

The occupation is an important factor in causing hernia; those trades requiring the most severe muscular effort having the highest proportion of persons ruptured. The increased liability to muscular strain in men is undoubtedly an important factor in explaining the greater proportion of ruptures in male than in female subjects. Parturition is a frequent cause in the female, especially of umbilical hernia.

There were 7433 cases of hernia met with in the male and 2534 in the female during a period of three years' consultation at the Central Bureau of Assistance in Paris, among patients applying for bandages. Inguinal hernia constituted 96 per cent. of these cases, 6220 of the men suffering from this form, double in 4126 cases, and single in the rest, occupying the right side in preference to the left in proportion of 1.46 to 1. Of all the cases a congenital origin could be definitely ascertained in only 479 cases. Berger (*La Sem. Méd.*, Oct. 26, '95).

Inguinal hernia is much more common in the male, and the reason for this is undoubtedly the fact that in man the inguinal canal is so much larger than it is in woman on account of the passage of the spermatic cord through this canal. On the other hand, femoral hernia is much more common in women because of the relaxation of the abdominal wall in all directions, due to child-bearing, and also because of the difference in anatomical structure. The female pelvis is much flatter and more horizontal than that of the male; consequently Poupart's ligament is relatively longer and tends to make the femoral canal wider and consequently weaker. Garrigues (*Med. News*, Jan. 22, '98).

Anything that tends to weaken the abdominal walls may be the indirect cause of hernia; for example, traumatism followed by the formation of cicatricial tissue, contusions, obesity, ascites.

The chief exciting cause of hernia is a sudden strain; the larger proportion of hernias, especially in adult life, come on

soon after some unusual effort. The hernia generally begins with a slight fullness over the canal, often associated with a little soreness or feeling of discomfort. In rare cases a fully-developed hernia may immediately follow sudden strain.

Two cases in which strangulation occurred simultaneously with the first appearance of the hernia are quoted by Bull and Coley (Dennis's "System of Surgery," vol. iv).

Indirect causes of hernia are chronic bronchitis, pulmonary affections in general, and habitual constipation.

Fourteen cases of hydrocele in which, during operation for that affection, a small hernial sac, the remains of a non-obiterated peritoneo-vaginal canal, was discovered at a point corresponding to the internal abdominal ring, though there was nothing in the history or symptoms to suggest hernia. To this number 11 more cases operated upon for hydrocele added, in 8 of which the same condition was found. The three exceptions noted have caused the writer to modify his former statement that hydrocele is always associated with non-obiteration of the peritoneo-vaginal process and consequent hernia, though he still emphasizes the frequent association of the two conditions. In his opinion this subject is of sufficient importance to merit the careful study of all surgeons, as, in the event of frequent coincidence of hydrocele with previous peritoneo-vaginal process being proven by repeated observations, it might be advisable, in operating for hydrocele, to extend the incision to the inguinal canal in order that the existence of such a previous process might be discovered and obliterated, thus insuring the patient against a possible interstitial external oblique hernia. V. Remedi (*Gaz. Osped.*, March 8, 1903).

Reducible Hernia.

Diagnosis.—A reducible hernia usually presents the following signs: A soft tumor or swelling is found in one of the hernial openings; this swelling disap-

pears on lying down, or on moderate pressure. It gives a distinct impulse on coughing, and usually it is seen to increase in size during the act of coughing or straining of the abdominal muscles.

In most cases there is a history of gradual development with sensations of discomfort in the region of the swelling, especially noted after long standing or walking. In the early period of development nothing more than a slight fullness may be found; but as the hernia descends it becomes a well-defined tumor. The character of the swelling varies according to the contents of the sac. If it contains bowel alone, it feels smooth and elastic; the impulse on coughing is well marked and reduction is often accompanied by a gurgling sound. Percussion yields a tympanitic note distinctly different from the flat sound produced in omental hernia. If the contents consist of omentum alone, the tumor is more uneven in outline, gives a lobulated feeling and is entirely without elasticity. Both bowel and omentum may be present, in which case there may be a combination of the physical signs already described. Not infrequently the bowel is perfectly reducible, while the omentum is adherent to the sac. The sensations of discomfort and the dragging pain, which may be very slight in a rupture of small size, may become very marked in a large hernia, especially if the latter be not controllable by truss.

Treatment of Reducible Hernia.—The various methods for the treatment of hernia may be classified as either palliative or operative. Palliative, or mechanical, treatment includes all the various appliances by means of which an effort is made to restrain the contents of the abdomen within the hernial orifice. In the majority of cases mechanical treatment does not aim to close the orifice,

though in children and young adults such a result is often obtained, thus effecting a permanent cure.

TRUSSES.—No description need be given of the great variety of trusses. The object to be accomplished by a truss should be the complete retention of the hernia without causing discomfort to the patient; there are many forms of trusses which fulfill this object satisfactorily. A good truss should consist of a pad to cover the hernial orifice and a spring or band to hold the pad always in the proper position. Steel is, I believe, the best material for this purpose. A spring should surround the pelvis entirely or in part, and should be so constructed as to retain its place either by its own elasticity or by the aid of a strap. The two forms of trusses which I consider to best meet the requirements of an ideal truss are the so-called Knight, or cross-body, truss and the Hood. Both these varieties may be used for single or double truss, and the Knight is quite as satisfactory in femoral as in inguinal hernia. The Hood pattern can be used only in inguinal.

The pad may be made of hard rubber, celluloid, cork, or of wood, covered with leather. Some cases not retained by this variety of pad may be satisfactorily controlled by the substitution of a so-called water-pad. These trusses may be made of any size and may be used in the youngest infants without discomfort. In infants and children great care should be taken that the spring be not too strong. The spring itself may be protected by leather, rubber tubing, or hard rubber. In rare cases—for example, emaciated infants—the worsted truss may serve a useful, but temporary, purpose. For routine work it is much inferior to a properly-constructed steel truss.

The worsted truss offers to the infant a somewhat greater hope of cure than to the adult. The feeling in Boston is that a truss of worsted is as effective as a more elaborate one, and that, if a cure is to result from truss treatment, it is as likely to follow the wearing of this form as that of any other.

The success of the truss depends entirely on the intelligence of the mother and the care with which she carries out her detailed instructions. She must have an ever-watchful eye on the truss, and readjust it as frequently as it becomes loose. J. C. Hubbard (*Annals of Surgery*, Oct., 1901).

The truss should be so applied that the pad rests over the internal ring rather than upon the pubic bone. In scrotal hernia it is better to apply the truss in the horizontal position, care being taken that the contents of the rupture be entirely reduced before the truss is put on. In incomplete rupture this is not so important. In infants and young children the truss should be worn both day and night. In adults it may be, in most cases, removed with safety on retiring. Careful attention to the skin beneath the pad is important, especially in children; frequent bathing with alcohol will be found of great service.

One cannot state definitely how long a truss should be worn. It depends largely upon the age of the patient and the size of the rupture. A very large proportion of infants and young children may be cured if treatment is carried out under favorable conditions.

Under 12 months of age the cure by truss is 58 per cent.; from 1 year to 5 years, only 10 per cent., and after that practically *nil*; in acquired hernia the truss-cures at 15 years are 5 per cent., and at 30 years only 1 per cent. C. H. Golding-Bird (*Practitioner*, Jan., '96).

After puberty cases of cure become fewer in number, and beyond 20 years of age it may be safely stated that there are few permanent cures by means of a truss.

At the Hospital for Ruptured and Crippled a truss is seldom left off in children until a period of two years has elapsed after the last appearance of the rupture. In infants under 1 year of age the truss may be left off sooner. In young adults the period should be lengthened rather than shortened, and after the age of 20 few cases will be found in which it is safe to discontinue the use of a truss. There is a certain class of cases in which no form of truss will retain the rupture. This applies to very large, scrotal herniæ with opening sufficiently large to admit four or five fingers. These herniæ are usually found in middle-aged and elderly people. Operation is in the majority of such cases contra-indicated, and the most we are able to do in the way of affording relief is a scrotal bag made of stout material and supported from the shoulders.

After an incarcerated hernia has been replaced in the abdomen hæmorrhage seldom occurs. One of two cases witnessed personally recovered, the other died six days after operation, of hæmorrhage. The treatment consists in the application of an ice-bag, with opium internally. Preindlsberger (*Wiener klin. Woch.*, Apr. 4, 1901).

The mechanical treatment of umbilical hernia differs with the age of the patient. In infants and young children no form of belt or truss is satisfactory, for the reason that it seldom retains its place for any length of time. The treatment used at the Hospital for Ruptured and Crippled is to apply a small pad, consisting of a wooden button-mold covered with leather, to the hernial orifice. This is held in place by a strip of rubber plaster two inches in width, which entirely incloses the abdomen. Care should be taken that the plaster be not applied too tightly and it should be changed at least every ten days. It seldom causes

excoriation, and in most cases the rupture will be found to have disappeared at the end of six months or a year. Very few cases go beyond puberty without being cured, and hence the impropriety of operating upon these cases.

Umbilical hernia of varying size is of very common occurrence in infants. It is ordinarily cured by adhesive-plaster strapping. The younger the child, the earlier the cure is to be expected. The fear of recurrence or failure is slight. J. C. Hubbard (*Boston Med. and Surg. Jour.*, July 25, 1901).

Results of the treatment by the writer, between 1886 and 1898, of 1182 cases of reducible hernia, by Schwalbe's method of injecting alcohol into the tissues around the sac. Schwalbe's original procedure (as outlined by him in 1876) consisted in the injection into the tissues around the neck of the sac (not into the sac itself) of from 2 to 3 grammes of twenty to seventy per cent. alcohol, the underlying principle being that a connective tissue hyperplasia should follow such an irritation, especially as alcohol is believed to be prolific of just such hyperplasias, such scleroses, in the organs. The injections were made daily for four to fourteen days, according to the sensitiveness of the patient and the degree of the subsequent reaction. With umbilical hernias, adhesive plaster strips were simultaneously used; with others, the truss. An intermission of a week or two following, after which the treatment is resumed. The result is a diffuse hardening around the neck of the sac, which shrinks and finally closes completely.

Since Schwalbe's original publication, his method has been used by a number of physicians and surgeons. Thus, in 1891, Steffen himself published the results obtained in 293 cases, a cure being effected in eighty per cent. of the small and medium sized reducible hernias. The longest duration of treatment was four years, the shortest one year.

Steffen's modification of the Schwalbe treatment consists in the substitution for the alcohol of a mixture consisting of 100 grammes of fifty per cent. alcohol

with 10 drops each of dilute phosphoric acid and formalin. In a case now and then, in which this mixture fails to bring about the necessary local reaction, he substitutes an injection of 1 or 2 grammes of extract of oak bark, which always occasions a very strong reaction. Solutions of tannin are not to be substituted for the bark, as they are too apt to induce abscess and necrosis.

The present series of cases extends from December, 1886, to the spring of 1902. During this period Steffen has treated 1052 patients with 1372 hernias, but on account of various reasons (non-completion of treatment for various causes, indifference, intercurrent diseases, etc.), only 901 patients and 1182 hernias are brought into the analysis. Of the hernias, the inguinal were 88.15 per cent.; crural, 7.02; umbilical, 3.90; and hernia of linea alba, 0.93. As regards outcome, the initial results were: Cured, 75.3 per cent.; improved, 7.1; and not cured, 17.6. By "cured" is meant a hernia which upon coughing and pressure, in both the sitting and recumbent posture, the earlier perceptible hernia is no longer visible or palpable; and, in the case of an inguinal hernia, in which the finger invaginated in the scrotal tissue cannot detect any impulse. As a result of treatment, the region of the injected area is harder than normal, and sometimes strandlike. The invaginated finger no longer enters an orifice but abuts against a thick-walled cushion. In not a few cases, however, the finger still penetrates a very narrow canal, though the case must be regarded as cured. That a complete closure is not absolutely necessary to a cure, results from the normal condition; and from the fact that there are many persons with wide hernial apertures or canals, in whom, nevertheless, no hernia protrudes, probably on account of a peritoneal adhesion at the inner ring.

Of the cures, 178 have persisted from 11 to 16 years; 305 between 6 and 10 years; and 221 from 1 to 5 years. In 77 cases the cure persisted till death or disappearance from under observation. Of the 17.6 per cent. improved,

about one-half offered no evident cause for the failure, but in the other half Steffen believes the inefficacy of treatment to have been due to the existence of chronic bronchitis and emphysema (19 cases); cough of influenza (4); emaciation with flabby musculature (6); and obesity (5).

Of the cured, 111 (or 12.5 per cent.) relapsed, the causes of relapse being the same conditons, and indeed in just about the same proportions, as those which involved non-healing. About one-third of the relapses presented no obvious cause. Relapsed cases can be treated again in the same way.

The author concludes that the treatment of reducible hernias by Schwalbe's method, as modified by himself, yields about 75 per cent. of initial cures, so that the patient can do all sorts of work without a truss and upon examination no hernia can be proved to exist. The duration of the treatment is at least one year in the case of small and recent hernias. The larger the hernia—that is, the wider the orifice and the older the hernia—the longer the time necessary for a cure (two or three years or more). In most cases the patient can go about as usual, and the treatment is to be carried out with constantly lengthening intervals. Special precautions are not necessary. Very wide apertures demand at the beginning daily injections of small doses with rest in bed. In general the method is applicable to all reducible hernias which can be retained by a truss. Hernias partially retainable can, as a rule, be improved, so that by aid of a truss the patient can carry on work again efficiently. The method is suitable for all ages. As it involves no narcosis and no long confinement, it is in many cases in the aged to be preferred to the radical operation. A treatment cumulative and compressed into a short time is not to be recommended, as the initial acute inflammation induced must be transformed into a chronic stage, and for this a longer time is needed. A toxic subsidiary action (*e.g.*, urticaria) is rarely observed. With the proper care and reference to the anatomical

conditions, unfortunate accidents are extremely rare. The procedure cannot, however, be said to be absolutely without danger. The mortality is about 0.04 per cent., as against 0.34 per cent. with operative treatment.

For initial results, the injection method evidently cannot compare with the radical operation, as the later yield nearly 100 per cent. of initial successes. As regard relapses, however, while it is not yet possible to state accurately the results of the operative treatment, Steffen's own observations would lead him to think the number not greatly below the 12.5 per cent. which occurs with the injection treatment. Kocher, to be sure, had only 1.2 per cent. of relapses, but other operators have had as high as 10.8, 11.9, and 15 per cent.

The injection treatment will be properly characterized if we say that it is a perfectly practicable restoration procedure in the treatment of reducible hernias which is suitable for a great number of cases, and is welcomed by many patients.

And as the treatment is one within the reach of every physician, and does not demand the developed surgical technique, but can be easily carried out, it deserves far more consideration than it has heretofore received. The author does not, however, say that he prefers it to the radical operation, but remarks that there are many patients who will not submit to that procedure, and for them the injection treatment can be used with good success. E. Steffen (*Sammlung klinischer Vorträge*, No. 369, 1904); *Editorial* (*Medical Record*, June 18, 1904).

Irreducible Hernia.

Any form of hernia may become irreducible. This condition is, however, more frequently found in umbilical than in any other variety of hernia. It is exceedingly rare in children and young adults, and most frequently found between the ages of 30 and 60. In irreducible hernia the contents are most frequently omentum, omentum alone occurring in 90 per cent. of the cases.

Omentum with bowel—entero-epiplocele—occurs next in order of frequency. Enterocoele—bowel alone—may become irreducible with numerous adhesions, but this condition is rare.

Clinically, irreducible hernia differs but little from reducible hernia, which has already been described, except in the fact that the contents of the sac cannot be replaced in the abdominal cavity. Persons suffering from this form of hernia are liable to frequent attacks of colic, and are almost always subject to constipation. In this variety of hernia inflammation and strangulation are more likely to occur than in reducible hernia.

Treatment of Irreducible Hernia.—If the hernia is not too large and the patient is a good subject for operation, an attempt may be made to effect a radical cure. Mechanical measures are, as a rule, very unsatisfactory. No form of irreducible hernia can be treated with an ordinary truss without much discomfort. A truss fitted with a concave pad often proves satisfactory in irreducible hernia of small size; in umbilical and ventral, a stout abdominal belt with a circular, flat pad, with a slightly-concave pad in herniæ of larger size, will furnish all the relief we are able to give for this class of cases.

If the hernia has been down but a few days and there are signs of local inflammation, the patient should be kept in bed for a few days and an ice-bag applied. In using an ice-bag in these cases where the vitality of the skin is more or less impaired, one should always see that the ice-bag does not rest directly upon the skin, otherwise serious sloughing may ensue. Gentle taxis may be used during the course of this treatment, but it should be of only brief duration and never violent. In very many cases of irreducible hernia a larger or smaller quantity of

serous exudate accumulates in the sac. This has been removed by aspiration. Still, while there is no objection to withdrawing the fluid by means of a small needle if the hernia is purely omental, little is to be gained by this procedure. If the rupture cannot be reduced in one or two weeks, it may be regarded as permanently irreducible, and either operation or suitable mechanical support should be employed according to the nature of the case.

[Macready's tables show that 53 out of 85 cases of inguinal hernia were reduced within, on an average, of 51 days; 32 within, on an average, of 2.8 years. These results show the advantage of operation, unless there is some decided contra-indication. WILLIAM B. COLEY.]

In irreducible inguinal and femoral hernia a very large number of patients are good subjects for operative treatment; that is, they are under 50 years of age and the hernia is of moderate size, varying between that of a hen's egg and two fists. The results of operation in these cases are extremely satisfactory, and, as far as my personal experience goes, results have been as good as in reducible hernia in patients of similar age. On the other hand, not a few cases, especially of umbilical and ventral hernia, are old epiploceles of very large size in very stout women with a great excess of fat in the abdominal walls. In such patients, as well as in those who are weakened by disease of the thoracic or abdominal viscera, operation should not be resorted to, and our efforts should be confined to preventing the rupture from increasing in size. I have always believed that there was great risk in operating upon very large irreducible hernia. This opinion is supported by the early experience of Banks and the recently-published results of Barker. I have known of several unpublished cases of

this kind in which death resulted from the operation. In addition to the great risk there is little prospect of a permanent cure.

Strangulated Hernia.

The term "strangulated" is applied to an irreducible hernia in which the loop of bowel is so constricted as to prevent the passage of fecal contents and to interfere with the circulation.

The most common causes of strangulation are heavy lifting, severe coughing, and straining. It may also be produced by a blow or a fall.

Study of statistics of 1491 cases of strangulated hernia. Up to 20 years strangulation is rare, but gradually increases until between 50 and 70 the largest number occur. The causes of strangulation are severe cough or bodily exercise, defecation, pregnancy, and difficult labor.

Strangulation occurs more frequently in crural than inguinal hernia, 57.6 per cent. to 40.2 per cent., respectively; 51.2 per cent. of the hernial sacs contain small intestine only, 5.4 per cent. only omentum, 29.8 per cent. contained both of these. Lipomata found in 9 per cent. of the cases. Oscar Henggeler ("Statistics of 276 Cases of Strangulated Hernia Operated upon in the University Clinic at Zurich from 1881 to 1894").

In irreducible hernia strangulation often results from inflammation or engorgement of the contents of the sac, or from adhesions formed between the sac and its contents.

It is unnecessary to mention the various theories that have from time to time been offered in explanation of the way strangulation is brought about. The best and simplest explanation is that of venous engorgement: the walls of the veins being more compressible than the walls of the arteries, blood continues to flow into the imprisoned loop of bowel long after its return has been cut off. This produces great engorgement and

rapid exudate of serum into the hernial sac, which makes reduction more and more difficult. The bowel first becomes of a brighter red, later bluish, then mahogany, and, finally, just before gangrene sets in, of a dull slate color. The exudation, which at first is clear, after a longer or shorter interval becomes turbid. Gangrene may occur at varying intervals, depending upon the tightness of the constriction, the earliest time within which it has been observed being four hours and the latest two weeks. The fluid in the hernial sac frequently contains bacteria, although in the larger proportion of cases thus far investigated, it has been sterile.



Double direct hernia.

Symptoms of Strangulated Hernia.—

The first symptom is usually pain, referred to the irreducible tumor at the site of the hernial orifice. Upon examination the tumor is found tense, and very tender on pressure; it gives no impulse, or, at most, a slight impulse on coughing. If the strangulation has existed but a short time, the tumor will give a resonant note on percussion. Later this sign may be absent, owing to an accumulation of fluid in the hernial sac. In some cases the pain is referred to the umbilicus rather than the hernial tumor.

Of all symptoms, vomiting is the most important. Vomiting is always persist-

ent, occurring at longer or shorter intervals. At first the vomitus consists merely of the contents of the stomach; if the hernia is not reduced, it contains bile, mucus, and finally becomes stercoraceous. Complete constipation is always a symptom of great importance. In rare cases diarrhoea may occur as an early symptom. There is always an increase in the pulse-rate and usually slight elevation of temperature, especially in the early cases. Later on temperature may become subnormal.

In strangulated omental hernia, with strangulation of omentum alone,—an extremely rare condition,—all of the symptoms are milder in character. Constipation may or may not exist.

[I have recently observed one case of acute strangulated omental hernia in which operation was performed on the third day. WILLIAM B. COLEY.]

Twenty-five operations in such cases in children under one year of age since May, 1898. There was only 1 death among the 25 cases. In addition, the 100 cases previously tabulated by the author indicate beyond all question that infants endure this operation very well. The report of a case is given in which the intestine had almost slipped back into the peritoneal cavity, leaving no palpable tumor, although the strangulation persisted. The operation was done on account of the symptoms and history. The child left the hospital on the eighth day. The records indicate that delay in interpreting the symptoms or reducing the hernia by taxis have been the greatest danger, while early operation has been the greatest safeguard. C. N. Dowd (Med. Record, Oct. 12, 1901).

Diagnosis of Strangulated Hernia.—

There is no condition likely to be met with in surgical practice in which it is more important to make an early and correct diagnosis than in strangulated hernia. In typical cases, fortunately, the diagnosis is attended with little difficulty. In a hernia previously irreducible,

the condition of obstruction or inflammation of the hernial contents may cause one to suspect strangulation. In obstructed hernia, however, the impulse is usually present; pain is less acute and the other symptoms are much less marked than in the case of true strangulation. The same is true of inflamed hernia. Strangulation sometimes occurs synchronously with the development of a hernia; I have observed two such cases. Given a patient with the symptoms of intestinal obstruction, careful examination should be made of all the sites at which a hernia might occur.

HYDROCELE OF THE CORD.—In the young there is a condition to which attention has been seldom called, and that not infrequently in the hands of the general practitioner causes a mistaken diagnosis of strangulation. This condition is hydrocele of the cord. In this disorder the swelling is more tense and cystic to the touch; it is more freely movable, more globular in outline, and has a more sharply-defined upper border, which, upon careful examination, shows that it does not enter the abdominal cavity. In a very few cases it may be difficult to differentiate between the two conditions from physical signs alone, but invariably the clinical history of the swelling will render the diagnosis easy. If hydrocele of the cord, there will be absolutely no general symptoms, and, if the statements of the parents be of any value, it will be found that the swelling has existed for several days or weeks, which shows the impossibility of its being a hernia.

[I have operated upon seven cases of strangulated hernia in infants, and in every case the general symptoms have been so well marked that mistaken diagnosis would have been impossible. WILLIAM B. COLEY.]

Treatment of Strangulated Hernia.—

TAXIS.—Taxis and operation comprise

the only methods of treatment to be considered. Taxis judiciously applied should always be used before operation is advised. Various positions of the patient are supposed to be of advantage in performing taxis. In inguinal hernia the pelvis should be elevated and the thighs flexed; in femoral hernia the thighs should be flexed and slightly rotated inward; in umbilical hernia both thighs should be flexed in order to relax the abdominal muscles. Traction on the tumor, followed by pressure, will often aid in reduction.

[Some, notably Hern, advocate withdrawing the fluid from the hernial sac by means of a fine hypodermic syringe prior to taxis. Out of 33 cases thus treated reduction was accomplished in 29. He advises this method only in cases of recent strangulation and which refuse operation. It certainly should not be advocated as a routine treatment. WILLIAM B. COLEY.]

In 63 cases of strangulated hernia 53 were reduced by local etherization. The patient is laid on the back, pelvis slightly elevated, and thighs bent, the parts around being protected by abundant smearing with olive-oil; every ten minutes or so a tablespoonful of sulphuric ether is poured on the hernial ring and tumor, until the latter loses its tightness and diminishes somewhat in size, when it returns spontaneously, or with slight help. Omental herniæ will not yield to this treatment. Finkelstein (Berliner klin. Woch., No. 19, '91).

For the performance of taxis it is better to place the patient on a table so slanted as to raise the hips; to crowd the abdominal contents toward the chest; to apply one hand to the neck of the tumor and the other to its body, and to draw it down so as to lengthen it out, at the same time compressing it. The utmost gentleness is essential. De Garmo (The Post-graduate, Sept., '92).

In strangulated hernia the patient should be placed in a hot pack, with ice over the hernia, $\frac{1}{2}$ grain of morphine being given by suppository. If, after

three hours, a gentle attempt at taxis fails, herniotomy should be resorted to. Morison (Birm. Med. Review, Sept., '92).

General anæsthesia should, as a rule, be avoided in cases of strangulated hernia in old and exhausted subjects. Keetley (N. Y. Med. Jour., Nov. 18, '93).

Violent or prolonged taxis is attended with great risk; the bowel may be lacerated or so severely contused that gangrene ensues. Often the sac has been ruptured by too forcible taxis. Methods of taxis which were perfectly justifiable twenty years ago when the mortality from operative treatment was very high, are no longer to be tolerated.

[Frikhoffer gives a mortality of 14.9 per cent. in 308 cases of femoral hernia successfully treated by taxis; 7.8 per cent. in 518 cases of inguinal hernia. WILLIAM B. COLEY.]

In cases that have been irreducible prior to strangulation—as is generally the case in strangulated umbilical hernia—taxis is clearly indicated. In cases where strangulation has lasted for twenty-four hours or longer, no attempt should be made to reduce the hernia.

Taxis should seldom be employed longer than from three to five minutes, and then only moderate force should be used. The application of an ice-bag (hot cloths are preferable in children and old people) may facilitate reduction. In infants and young children it is a good rule, after an unsuccessful attempt to reduce the hernia by taxis, to immediately prepare for operation, and then, if reduction under an anæsthesia be not successful, operation may be at once performed without subjecting the patient to a second anæsthetization.

Number of cases in which the prolonged topical use of ether had resulted in the spontaneous reduction of strangulated hernia. A compress moistened with ether was applied over the hernia and kept moist with ether dropped on to it. The reduction took place suddenly, and

was sometimes accompanied by a cry of pain from the patient, followed immediately by a declaration of relief. The amount of ether employed was occasionally as much as $\frac{1}{2}$ pint, and the duration of its use varied from fifteen minutes to two hours. Fiessinger (*Jour. des Praticiens*, Nov. 10, 1900).

Operation for Strangulated Hernia.—

INCISION.—Instead of the old incision over the most prominent part of the tumor, usually the upper scrotum, even now employed by many surgeons, it is much better to make the ordinary Bassini incision, parallel to Poupart's ligament, extending only slightly beyond the external ring. This incision is carried down to the aponeurosis of the external oblique, which is slit up about two inches.

SAC.—The sac is next exposed by careful dissection and opened by a scalpel or scissors. On opening the sac a smaller or larger quantity of fluid almost always escapes. The character of this fluid should be carefully noted, inasmuch as this gives an important indication as to the condition of the bowel. If the bowel is simply congested, the fluid will be clear; if inflammatory changes have taken place, it will be turbid, but free from odor; if the intestine is gangrenous the fluid is sero-purulent and almost always has an intestinal odor.

A neglected point in the treatment of strangulated hernia is the necessity of emptying the bowel above the constriction, thus relieving not only the constipation, but relieving the patient of the accumulation of feces from which he has been absorbing various poisons. C. H. Whiteford (*Brit. Med. Jour.*, June 16, 1900).

DIVISION OF CONSTRICTION.—Before attempting to reduce the bowel the constriction must be divided. This may be either the neck of the sac or the fibrous structures forming the external ring, which have already been slit up.

By performing the operation as indicated, the constriction caused by the external ring disappears with the slitting up of the aponeurosis of the external oblique.

[If the real cause of the constriction were due to the neck of the sac, it would still be impossible to reduce the hernia. In every one of my seven cases (in children) the aponeurosis was widely opened, and this alone was sufficient to render reduction of the hernia easy, which would have been impossible had the constriction been due to the neck of the sac. This view, as I have stated, is directly contrary to the teachings of most writers. Taniel states that, out of 81 cases of strangulated hernia in children which he collected, the neck of the sac was regarded as the cause of the constriction in 58 cases. WILLIAM B. COLEY.]

MANAGEMENT OF THE CONTENTS.—

The bowel should be treated with the utmost gentleness, and a warm towel should be frequently applied until it is reduced. If the serous coat is still smooth and glistening, it may be safely reduced; purple or mahogany color—provided it has not lost its elasticity—is not a contra-indication for replacing it in the abdominal cavity. In cases of doubt as to the propriety of returning the bowel, it is well to apply a hot towel for a few minutes, the constriction having been relieved. If the circulation materially improves, it can be returned with safety.

If the peritoneal coat is granular and devoid of lustre and remains cold after the division of the constriction, it would be the better plan not to return the intestine, but to allow it to remain in place, protecting it by a sterile dressing. Examination a few hours later will determine whether it has sufficient vitality to permit of its being returned with safety into the abdominal cavity.

If the bowel is gangrenous, and there is no doubt that it is unsafe to return

it, two methods of procedure may be adopted: Primary resection may be performed, or the gangrenous knuckle may be left in place. If left in place, there is no need of sutures, as the adhesions will be sufficient to prevent it from slipping back into the abdomen. The gut may be simply opened and the wound fully protected with antiseptic dressing, the gangrenous knuckle may be removed, and the cut ends of the gut fastened to the skin by means of sutures.

In the choice of procedures much must be left to the judgment of the operator himself. If he is a surgeon possessing the requisite technical skill, and the patient's condition does not contra-indicate a prolonged operation, it is probable that primary resection will give the better result. This is especially true if the amount of intestine is small.

Two hundred and eighty-nine resections for gangrenous hernie compared with two hundred and eighty-seven cases in which an artificial anus was established. The mortality in the former group is $49\frac{13}{100}$ per cent.; in the latter, $74\frac{22}{100}$ per cent., or 25 per cent. greater. In analyzing the causes of death, the advantage is, in each instance, in favor of primary resection. Diffuse peritonitis and profound collapse regarded as almost the only contra-indications to resection. Zeidler (Centralb. f. Chir., Jan. 21, '93).

Case of rapid gangrene of a hernial sac. The patient, aged 48, had a reducible hernia for nine months, and had worn a truss. After a full meal he sneezed and suffered agony, having ruptured the bowel into the sac. An operation performed four hours later showed the sac to be perfectly black. The bowel was simply congested, and a tear $\frac{3}{4}$ inch long was found in it. The gangrene was strictly limited to the sac. There was no strangulation of the sac or contents. Robert Smith (Brit. Med. Jour., Feb. 1, '96).

The treatment of a doubtful or gangrenous loop of bowel in a hernial sac can hardly be considered as ordained by

universal custom. Resection of the loop and suture of the ends is, from all points of view, the most satisfactory in those cases where it can be legitimately done; but there are not a few patients in whom such a course would be wholly unjustifiable. In these the alternative courses are: 1. Opening of the bowel (a) with, (b) without, the division of the constriction at or near the neck. There are several recorded examples of persisting obstruction when the bowel has been merely opened. The division of the constriction adds no risk worth considering, and should be adopted. 2. The removal of the gangrenous loop and the stitching of the open ends to the skin, or the introduction into the distended end of a Paul tube. 3. Helferich's operation. The pulling down of healthy bowel beyond the loop (above and below it), and the union of these by a Murphy button. The gangrenous or doubtful loop is covered with an antiseptic dressing, and resection performed when the patient has rallied. But in all cases the surgeon must recognize that, if possible, with reasonable prospects, resection and suture should be performed. B. G. A. Moynihan (Practitioner, Nov., 1900).

Resection of the diseased portion of the bowel recommended with Schleich's infiltration method of anæsthesia. The dangers of shock and collapse after the operation are thus obviated besides that of inhalation pneumonia. The Murphy button is used after carefully emptying the intestines. W. Petersen (Deutsche med. Woch., Mar. 7, 1901).

In patients suffering from prolonged strangulation and who are much prostrated, or when the amount of intestine is very large, it is much safer to leave the gut in place to be dealt with at a subsequent operation. If the operator has had little experience in intestinal surgery, there is no room for debate as to which is the safer procedure. In many cases of femoral hernia the artificial anus has been known to close spontaneously.

[In 382 cases treated from 1822-1853, Frikhoffer found the mortality to be 19.4 per cent. in cases strangulated 1 day

or less; 49 per cent. in cases strangulated 2 days. Habs Reichel, in 129 cases operated upon under aseptic conditions, found a mortality of 12.5 per cent. in cases that had been strangulated 1 day; 26.1 per cent. in those that had been strangulated for 2 days. WILLIAM B. COLEY.]

Accounts of one hundred cases of strangulated hernia in infants under 1 year, all of which were subjected to operation. There were twenty deaths. Death after operation in these cases is almost invariably due to delay. Charles



Femoral hernia in child aged 7 years.

N. Dowd (Archives of Pediatrics, Apr., '98).

No patient should wear a truss unless operation is positively contraindicated. The exceptions to the radical cure are: (1) Children under four years of age. A proper truss will perhaps cure two-fifths of such cases. (2) Adults the subjects of serious organic lesions of the heart, lungs, or kidneys, or very fat patients in whom the intestine and omentum are adherent to the sac. (3) Adults, over sixty years, in whom (3) Adults, over sixty years, in whom

the hernia can be held in place by a truss. Taxis should never be performed for more than five minutes, and an anæsthetic should not be employed unless the patient can be operated upon at once should taxis fail. The Bassini operation is believed to be the best operation for inguinal hernia. For femoral hernia the Bassini operation may be used, though the author prefers the pursestring method. Umbilical hernia, if congenital, is best treated by the use of a truss up to the thirteenth year. If the hernia still persists operation may then be resorted to. Deaver (American Medicine, Dec. 12, 1903).

Indications and Contra-indications for the Radical Operation.—CHILDREN.—

The indications for operation may be classed as follows:—

1. Cases of adherent omentum.
2. Cases complicated with reducible hydrocele.
3. Cases irreducible and strangulated.
4. Cases unable to obtain the care and attention requisite for successful mechanical treatment.
5. Cases over 4 years of age, where mechanical treatment has been faithfully tried for a number of years without benefit.
6. Femoral hernia in children, which, though rare, cannot be cured by trusses.

I believe it is seldom necessary to operate upon children under 4 years of age, and the practice of some surgeons of operating upon infants under 1 year is open to serious question.

Umbilical hernia in children should, with very rare exception, never be operated upon, for the reason that they are almost invariably cured either spontaneously or by means of mechanical support.

Study of 232 published cases of strangulated hernia in infants. The relative rarity of this condition in infants is attributed to the feeble resistance of the tissue forming the canal. Appendicu-

Fig. 1



Fig. 2

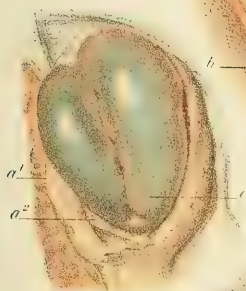
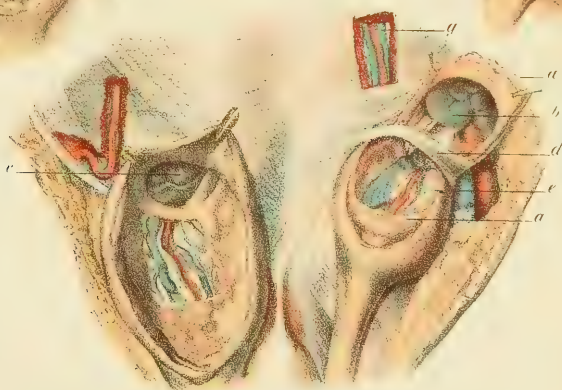


Fig. 3



Fig. 4



Dissection of Inguinal Hernia

Fig. 1. *a*. Sac and Overlying Fascia, *b*. Spermatic Cord.

Fig. 2. *a'* Fascia, *a''* Sac, *c*. Bowel.

Fig. 3. *a*. Infundibuliform Fascia overlying the Sac and Sac, *d*. Arched Fibres of External Ring, *e*. Omentum, *f*. Gut, *h*. Fascia of External Oblique

Fig. 4. *a*. Sac, *c*. Bowel, *e*. Omentum, *d*. Arched Fibres of External Ring, *g*. Epigastric Vessels

lar forms of hernia are common in infants. The symptoms of strangulated enterocoele differ slightly from those of hernial appendicitis. In the latter the arrest of faecal matter and gas is not absolute, and the case may result in serotal suppuration. The prognosis of hernial appendicitis is less favorable than that of strangulated enterocoele. The result of operation in strangulated hernia depends on the general condition. If a healthy appendix is found in the sac of a strangulated hernia, it should, in the author's opinion, be removed if the general condition is sufficiently good. Estor (*Revue de Chir.*, June, 1902).

ADULTS.—1. In a general way, the younger the patient the better the chances of radical cure.

2. Operation is indicated in all young adults, inasmuch as there is little prospect of cure by a truss after the age of maturity. The operation in skilled hands is attended with almost no risk and the chances of a cure without the further need of a truss are excellent.

3. All cases of irreducible omentum in patients that are fit subjects for an abdominal operation.

4. All cases of femoral hernia if no contra-indication is present.

In the treatment of inguinal hernia in children the following are the cases in which an operation may be advised: 1. Where a child is being properly fed, but in whom a hernia after a fair trial is not retained by a suitable truss, so that there is little or no chance of a spontaneous cure. 2. Where part of the contents of the sac are irreducible. 3. Where a truss has been worn for at least three years, but with no apparent cure of the protrusion. 4. Where a child has reached the age of at least three years, but has never worn a truss. 5. Where a herniotomy has to be performed for strangulation. Eccles (*Brit. Med. Jour.*, May 13, '99).

CONTRA-INDICATIONS.—Very large irreducible hernia in stout persons should not, as a rule, be operated upon. The

risks are large and there is little prospect of permanent cure.

Radical Operation for Inguinal Hernia.

At present the weight of evidence is strongly in favor of the superiority of Bassini's method in operations for inguinal hernia. This method, first performed by its author in 1884, was introduced to the profession in 1890. Bassini published 251 cases with but 1 death and 7 relapses. It is performed in the following manner: The canal being laid open to the internal ring, the sac is sepa-



Double inguinal hernia (inoperable).

rated, drawn down, ligated, and resected. The closed peritoneum is then returned, the spermatic cord is pushed aside, and the posterior margin of Poupart's ligament is exposed. The border of the rectus and the edges of the internal oblique, the transversalis, and the transversalis fascia are then sutured to Poupart's ligament under the cord. The latter is then placed upon the layer of the abdominal wall thus formed, and the border of the external is sutured to Poupart's ligament over the cord, avoiding compression of the latter. A new canal

is then formed for the cord. The wound is then closed.

Halsted's method, while it closely resembles that of Bassini, differs in the direction of more complicated technique. The published results, though excellent, are inferior to those of Bassini.

Report of 233 herniotomies performed in Professor Halsted's clinic in the past two years, out of which 49 were performed under local anæsthesia. Almost all cases of hernia, with the possible exception of those in young children, could undoubtedly be subjected to the radical operation under similar local methods, but, when a general anæsthetic can be safely administered, for various reasons it is much to be preferred by both patient and operator. In cases of strangulation, where the vomiting and shock from the absorbed toxins is great, the use of a general anæsthetic is contra-indicated. It is in border-line cases of this sort that local anæsthesia gives the best chance of recovery. In just such cases do we often meet with death under or rapidly following the general anæsthetic. Schleich's 1 to 1000 cocaine-muriate mixture for infiltration anæsthesia used. The solutions of eucaine-B, suggested by Braun, have no advantage, while the duration of the eucaine anæsthesia is not quite as great. For anæsthetizing the individual nerve-trunks a $\frac{1}{2}$ - to 1-per-cent. sterilized solution of eucaine-B or cocaine is used. It is injected directly into the nerve.

The patients are prepared for operation by accustoming them to confinement in bed and getting them used to evacuating the bowels and passing the urine without getting up. One-tenth or $\frac{1}{8}$ grain of morphine is injected three-fourths of an hour before the operation, and repeated just before it is commenced. Its disadvantage is the confining of the bowels. The patients are often shaved and prepared on the table. The skin is infiltrated in the line of the incision. The tissue is found to be very vascular, and all bleeding is stopped, as it is essential to the dissection. It is unnecessary to anæsthetize the panniculus. Nerve-fibres

may be encountered in it, and veins that will cause pain if resected. The wound should be deepened to the aponeurosis at the upper angle near the external ring. The aponeurosis is then opened in the line of the fibres from the external ring, and the ilio-hypogastric and inguinal nerves immediately cocainized with a 1-per-cent. solution. This produces anæsthesia of the whole lower operative field if the high incision is employed and the scrotum not opened. The ilio-inguinal and genital branches should be carefully displaced in the lower angle of the wound. The closure of the wound does not require any further anæsthesia. If the subcuticular silver suture is employed, the skin edges will still be sufficiently anæsthetic to permit of its introduction. Sometimes a few inhalations of chloroform, not enough to produce unconsciousness, are necessary if the patient becomes very nervous or a sensory nerve-fibre is cut. No post-cocainization pain has been complained of, while the infiltration has not interfered with primary union under one dressing generally in ten days. Cushing (*Annals of Surg.*, Jan., 1900).

Kocher's method of radically treating hernias is the only one which stands in the same class with the method practiced by Bassini. Kocher lays particular stress on the careful isolation of the hernial sac, especially its neck. He attaches but little importance to strengthening the abdominal walls. He eliminates the hernial sac without splitting the inguinal canal. The cord is freed at its point of exit from the external ring, and, after splitting the cremaster muscle and the common vaginal tunic, the sac is separated from the cord as high as possible. A short cut, half a centimetre long, is then made through the external oblique fascia, one or two centimetres to the outer side of the external ring. This opening is deepened down through the peritoneum. A closed forceps is introduced into the peritoneal cavity and along the sac of the hernia until it grasps the end of this sac. By traction upon the forceps the hernial sac is invaginated, and its end is drawn through the small wound made over the

outer portion of Poupart's ligament. The edges of the peritoneal wound through which the invaginated sac has been drawn are picked up by three or four pairs of forceps and secured either by suture or by ligature, together with the sac. A couple of sutures secure the remainder of the wound, and the operation is completed, unless it seems advisable to close the canal by one or two sutures.

The mortality of 1600 operative cases treated by the Bassini method is less than $\frac{1}{2}$ of 1 per cent., while Kocher had no mortality in 191 cases. Hence both operations can be regarded as devoid of danger.

As to the permanence of cures, Franz notes, of 593 cases of Bassini operation, the histories of which have been followed, that there was recurrence in less than 5 per cent. The author, out of 67 of his own cases, notes recurrence in less than 2 per cent. Kocher, of 83 cases treated by the invagination method, notes a recurrence of less than 2 per cent.

In regard to the choice of operation, it is noteworthy that in nearly all Kocher's cases the hernias were small; hence the abdominal walls were not greatly weakened. When the hernias are very large, however, simple ablation of the sac cannot possibly insure a permanent healing. Under such circumstances the abdominal wall must be reconstructed, and here the Bassini operation is indicated.

The results of operative treatment of femoral hernia are quite as satisfactory as those of inguinal hernia. The operation consists in freeing the hernial sac up to Poupart's ligament, and suturing or ligaturing it at this point. The femoral canal is then closed by suturing Poupart's ligament to the pubic crest or the pectineal fascia.

Kocher treats the sac of a femoral hernia by invaginating as described in the treatment of inguinal hernia.

Where, after laparotomy, the peritoneum, the muscles, the external aponeurosis, and the skin have each been separately sutured, there is no likelihood of hernia.

The umbilical hernias are treated by a total extirpation of the sac and of the umbilicus. The sheath of the rectus muscle is then split, after which the peritoneum and posterior layer of the rectus sheath are sutured; next the bellies of the rectus muscles are opposed; and finally the aponeurosis is sutured. Of 10 cases thus operated upon, 2 recurred.

Kocher, after extirpation of the sac and navel, closes the opening by a continued silk suture passing through all the structures except the skin. Rotter (*Therap. Gaz.*, from *Therap. Monats.*, H. 1, 1901).

The brilliant results of Macewen have not been generally obtained by other surgeons, while the transperitoneal method very recently introduced by Dr. George R. Fowler, which may be, in some respects, preferable to other methods, is as yet too recent to warrant passing judgment upon.

In radical operation for hernia six weeks in bed and two weeks more of abstinence from physical exertion should be the minimum period allowed. Kocher (*Corr. f. Schweizer Aerzte*, Sept. 15, '92).

In any operation aiming at radical cure it is necessary to support and strengthen the fascia transversalis. The most frequent cause of recurrence after some of the recent operations is owed to neglect of this point. Heuston (*Brit. Med. Jour.*, Apr. 18, '96).

A method has been employed in about 60 cases by Bull and Coley during the past eight years, which they have named "suture of the canal without transplantation of the cord," the other steps being identical with Bassini's operation. The results, thus far, have been nearly, if not quite, as good as in Bassini's, though the number is as yet too small to estimate its comparative value; its only advantage lies in the direction of greater simplicity in the technique.

All methods in which the sac is allowed

to remain behind to be disposed of in various ways should be abandoned. If the sac is left behind there is less chance of securing primary union, and it affords no additional security against relapse.

Circular letter was sent to over one hundred prominent surgeons. Thirty-four surgeons gave an approximate percentage of recurrence in their practice; this percentage varies from 1 to 15 per cent. This last percentage agrees with the figures of Professor Girard, of Berne, who claims that the percentage of recurrence in Europe will amount to 15 per cent. The percentage will average 5.58 per cent., based on 6027 operations by 34 surgeons. From statements contained in letters received in answer to the circular, it is fair to infer that only one-half of the total number of operations were reported. This would bring the percentage up to near 15 per cent. These letters show that infection is less frequent and that there is no recurrence when wire or silk-worm gut is used in the Phelps, Halsted, or Abbe method of operation.

The Phelps operation considered an ideal one. It is the only one that insures a successful and a permanent cure. As stated by Abbe, silver wire or silk-worm gut should be employed in preference to absorbable sutures. Suppuration has nothing to do with causing recurrence; the real causes of relapse or recurrence are deficient origin (attachment) of the internal oblique muscle, pressure of truss (where one has been worn), length of time that hernia has existed, lack of nerve- and blood-supply, and intra-abdominal pressure rupturing the cicatrix. The latter factor can be disregarded if the Phelps method is employed, because if the wire mattress is once placed properly there is no possibility of relapse by a rupture from the intra-abdominal pressure. The doctrine advanced by some writers doubted that varicocele is a causative factor in inguinal hernia. All herniotomies should be regarded as modified laparotomies. B. M. Ricketts (Phila. Med. Jour., Feb. 9, 1901).

Results of Operation.

It must now be admitted that hernia can, for a considerable time at least, be cured by operation. Whether these cures will prove permanent cannot, as yet, be stated positively, for a permanent cure, strictly speaking, would mean freedom from relapse until the death of the patient. Although no definite time-limit can be laid down beyond which relapse may not occur, nevertheless a careful study of cases operated upon up to the present time enables us to arrive at certain fairly-definite conclusions.

The writer's inguinal cases numbered 937, the femoral 66, 500 had been in children under fourteen years of age. It is a mistake to suppose that operations on children for the relief of hernia are easy. The technique should be followed out with precise care, and because the smallness of the parts is often a very difficult matter. The writer performed Bassini's operation on nearly 200 women without a single recurrence. The tense external abdominal ring, rather the neck of the sac, as is generally taught, causes the majority of strangulations. Increased experience proves the value of absorbable material. W. B. Coley (Med. News, May 16, 1903).

In view of these facts it may be stated in a general way that, if a rupture is sound at the end of one year after operation, there is a strong probability of permanent cure, while, if it remains well for two years, the chances of relapse are very small. Ninety-five per cent. is a conservative estimate of cures following Bassini's operation if the operation has been properly performed. This estimate presupposes a judicious selection of cases.

[Some operators openly state that they never select their cases. There is no field in surgery, I believe, in which there is greater need for the exercise of good judgment than in that of operations for the radical cure of hernia. WILLIAM B. COLEY.]

The practice of operating upon all

cases of hernia, irrespective of the age of the patient and the size of the hernia, cannot be too strongly condemned.

Roux, of Lausanne, Switzerland (personal communication), has operated upon 1398 cases, with 5 deaths.

[Results of 1042 operations for radical cure performed since 1888 by Bull and Coley; 522 by Dr. Bull, including 66 children, and 531 by myself, including 365 children. Of Dr. Bull's cases, 134 were operated prior to 1890 by the Czerny and Socin methods, and show the great superiority of the Bassini method.

Out of the 134 cases operated upon prior to 1890, only 49 healed by primary union; 40 per cent. relapsed within two years after operation, and most of these relapses occurred during the first year after operation. It should be noted that of the 134 cases only 16 were in children under 14 years of age.

In regard to the suture material, silk was used in 12 cases, and in every case traced a sinus developed after a longer or shorter interval after operation, remaining open until one or more sutures were finally discharged or removed. The silk was prepared by boiling in a 5-per cent. carbolic-acid solution just before using it.

The mortality (3 deaths) was considerably higher than that in the later cases. Death was caused in 1 case by ligature of the omentum too close to its attachment to the bowel; 1 died of hæmorrhage and 1 of peritonitis.

Of the total number of cases,—1053,—924 were inguinal, 94 femoral, 19 umbilical, and 15 ventral; 100 of the cases were females, 461 were children between 4 and 14 years of age, and 592 over 14 years.

Bassini's method was employed in 618 cases, with 12 relapses. Of these cases 371 were children under 14 years of age, with 3 relapses, or $\frac{3}{4}$, of 1 per cent.; 247 adults over 14 years, with 9 relapses, or 3.7 per cent. In the 60 cases in which the cord was not transplanted, but in which the other steps of the technique were the same as in Bassini's method, there were 4 relapses. Of Dr. Bull's cases, 170 were operated upon by Bas-

sini's method, and of Dr. Coley's cases, 448 were operated upon by Bassini's method.

Broca, of Paris, has operated upon 1064 cases by his own method, with 9 deaths; a large proportion of these cases were children. The number of cases traced is not stated. Halsted has operated upon 309 cases with 1 death. In 205 operated upon by his own method, there were 12 relapses. Macewen has operated upon 224 by his own method, with 2 deaths. Of this number 107 were traced with 15 relapses and 93 cases well from two to ten years after operation. WILLIAM B. COLEY.]

Analysis of 133 cases of hernia operated upon for radical cure with no mortality, and, as far as traced (78 cases), only 6 relapses. One-third of the entire number had been under observation ten years. The writer attempts to reconstruct the canal, and uses buried sutures of kangaroo-tendon, to which he attributes, in great measure, his very excellent results. Marcy (*Lancet*, Aug. 19, '93).

There were 477 operations for radical cure in children under the age of 15 years,—14 for umbilical hernia, 41 for inguinal hernia in girls, and 395 for inguinal hernia in boys. Of all these cases, a single one, a boy, died from septic peritonitis. Although strangulation, which is not common in very young children, yields readily to taxis, as a rule, operation should nevertheless be performed, especially when associated with ectopia. Of 250 cases seen after six months, only 3 had had a relapse; 2 of these had again been operated on and definitely cured. Several of the children had had whooping-cough after the operation. Broca (*Nouv. Arch. d'Obstet. et de Gynéc.*, Aug., '95).

Report of 324 cases which, with but one exception, were traced beyond two years. Two hundred and seventy cases remained cured, while 54, or 16.7 per cent., were found to have relapses. There were 288 cases of inguinal hernia; of these 48, or 16.7 per cent., relapsed. Of 22 cases of femoral hernia, 6 relapsed, or 27.3 per cent. Fourteen cases of umbilical hernia showed no relapses, but

are all presented as cures. Another series of cases were operated upon between 1890 and the middle of 1894. Analysis of these showed that the percentage of final cures bears a direct proportion to the age of the patient. The younger the patient, the better the result. The cases over 40 years of age show six times as many relapses as those under 10.

Two hundred and thirty-five cases were operated on by the method of Ferraro slightly modified: free dissection of the hernial sac and high ligation beyond the neck. The anterior pillars are then sutured with silk without transplantation of the cord; 53 only operated upon by Bassini's method, substituting the purse-string suture for the interrupted sutures employed by Bassini and using silk. Conclusion that the suture of the anterior pillars is by far preferable to Bassini's method. Results also confirmed the opinion held by most surgeons at present, that primary union is of great importance in securing good and permanent results. Roux (*Rev. Méd. de la Suisse*, vol. xvii, July, '97).

Cure of hernia cannot be considered radical until a period of two years has elapsed since operation, and even after three, four, or five years there may be recurrence.

Of the three varieties of abdominal hernia commonly encountered the umbilical is most readily cured. The crural is the one in which failure is most frequent. The likelihood of cure is proportionate to the youth of the patient. Taillens (*Revue Méd. de la Suisse Romande*, July 20, '97).

[Barker (*Brit. Med. Jour.*, Sept. 10, '98) reports 200 consecutive operations for the radical cure of hernia; of these 50 were reported in 1890. But 3 deaths in 200 cases, 1 of which was due to ether poisoning. In both of the other fatal cases the hernia was a large, irreducible sigmoid hernia.

In 21 out of 200 cases, sutures came away either while the patient was in the hospital or later at home. (This affords further evidence in support of the opinion frequently expressed by Dr. Bull and me, that non-absorbable sutures not in-

frequently cause troublesome sinuses.) Own method employed in 79 cases; in 57 Bassini's; in 7 Kocher's; in 2 MacEwen's. Bassini's operation, when carefully carried out, regarded as the best operation yet devised.

Statistics of Kocher's operations (*Deutsche Zeit. f. Chir.*, B. 48, H. 5, 6, S. 538, '98) for radical cure of hernia. Since 1893 he has operated upon 163 patients, with 197 herniæ. Of these, 148 were inguinal, 17 femoral, 18 umbilical, ventral, and epigastric. The youngest was 1 year, and the oldest 71 years. Of inguinal, 26 were under 1 year; 78, 1 to 10 years; 38 over 10 years. WILLIAM B. COLEY.]

In the radical cure of hernia no operation has yielded such brilliant results as Bassini's. During the past eight years 639 herniæ have been personally operated upon, with but 1 death. Bassini's technique is departed from in the substitution of chromicized kangaroo-tendon for silk in the buried sutures, and a suture is introduced just above the cord, it being passed through the same structures below the cord, with a desire to prevent any farther separation of the tissues above the new internal ring, and keeping the cord restricted to narrower limits. The use of absorbable sutures is the most important modification of modern methods. The operation should be performed upon children over four years of age on whom a truss has been given a fair trial without marked improvement, in cases complicated by fluid in the hernial sac, and in all cases of femoral hernia. The results of the operation for femoral hernia are often more successful than for inguinal. W. B. Coley (*Med. News*, Sept. 2, '99).

Dangers and Complications Associated with the Radical Operation.

The chief dangers to be guarded against are pneumonia and wound-infection. Prior to 1890 in the larger proportion of fatal cases death was due to wound-infection; but at present, with the gradual perfection of technique, I consider pneumonia from the anæsthetic the greater source of danger. The mortality

has been gradually reduced from about 6 per cent., in cases prior to 1890, to less than 1 per cent. in cases operated upon during the last decade. Dr. Bull and I have collected 8000 cases operated upon since 1890, showing a mortality of less than 1 per cent.

PRECAUTIONS.—The greatest care should be exercised in cleansing the skin of the patient, as well as the hands of the surgeon and assistants.

Some form of absorbable material, sufficiently durable to permit of tendinous union, should be used for all the buried sutures. Kangaroo-tendon, on account of its strength and pliability, may be regarded as superior to chromicized catgut. Catgut, if properly chromicized, may be nearly as good, but, as usually prepared, it is more harsh than the tendon and is more likely to cause irritation and subsequent production of a sinus, as is so frequently the case with non-absorbable suture-material. My objections to non-absorbable sutures, including silk, silk-worm gut, and silver wire (formulated by me in 1895) were based upon the observation of 16 cases in which the use of sutures was followed by the formation of sinuses and extrusion of sutures. These sinuses often required many months to heal, and the prolonged suppuration so weakened the canal that in most cases relapse followed. This opinion has been further confirmed by more recent observations of Dr. Bull and me, 26 cases having been personally observed.

Fine catgut is employed for the ligation of the arteries and for closing the skin. Catgut is prepared by boiling it in absolute alcohol under a temperature of 210°. Both catgut and tendon that I have employed during the past seven years have been prepared by Van Horn & Co., of New York. Bacteriological

tests have invariably proved the suture-material sterile.

COMPLICATIONS.—Orchitis occasionally follows operation, especially if the hernia have been of the congenital type and of large size. The application of an ice-bag for a few days always relieves this condition. In adult cases it is of great advantage, immediately after operation, to apply a strip of rubber plaster, about two inches wide, across the thighs in such a way as to form a support for the testes. It prevents any dragging on the cord and adds much to the comfort of the patient.

Injury to the Cord.—If the operation is performed with due care, there is no danger of injuring the cord, even in children. If the bleeding vessels are at once caught and tied, the wound kept clean, the different layers of tissue can be recognized as easily as in a dissection on the cadaver. Bassini's operation cannot be properly performed unless this be done.

Atrophy of the Testis.—When Bassini's operation was first introduced, atrophy of the testis was regarded as a possible danger, and this deterred some surgeons from employing the method. Not a single case of atrophy of the testis has been observed by Dr. Bull and me in over 650 of Bassini operations. Cases of atrophy have been occasionally observed after Halsted's operation, by Dr. Halsted himself, as well as by other surgeons. O'Connor very recently reported 20 per cent. of atrophy of the testis in 129 cases operated upon by Halsted's method.

Study of 459 cases of hernia operated on in the Johns Hopkins Hospital from June, 1889, to January, 1899, with special consideration of 268 cases operated on by the Halsted method, and the transplantation of the rectus muscle in certain cases of inguinal hernia in which the conjoined tendon is obliterated.

For a non-strangulated hernia: The probabilities of failure are less than $\frac{1}{2}$ of 1 per cent.; of pneumonia, if a general anæsthetic is given, $\frac{1}{2}$ per cent.; of phlebitis of the leg, 0.7 per cent.; of suppurative from the wound, 4 per cent., and, since the introduction of gloves, less than 1 per cent.; of a recurrence of the hernia, if femoral, none; if umbilical or ventral, in which the recti muscle can be included by the suture, none; if the muscles are too widely separated to be included by the suture, 20 per cent.; if an inguinal hernia, less than 4 per cent. Now that the rectus muscle is transplanted when the conjoined tendon is obliterated, that the size of the cord is diminished by the excision of the veins or the splitting of the cord, transplanting the veins only, the percentage of recurrence will be reduced much below 4 per cent. Thus far in cases in which these modifications have been introduced there has been no recurrence.

Pneumonia following the general anæsthetic is the chief danger in operations for hernia; there were 5 cases (1.2 per cent.) in non-strangulated hernia, 2 of which died later of tuberculosis of the lungs. In 15 cases of strangulated hernia in which the gut was gangrenous, or in which peritonitis was present before operation, 14 died. Twenty-five per cent. of these showed evidences of a bronchopneumonia at the autopsy; in 1 case it was the cause of death (the suture for the gangrenous cut was successful); in 13 cases peritonitis was also present. Bloodgood (Johns Hopkins Hosp. Reports, Nos. 5, 6, 7, 8, and 9, vol. vii, '99).

Many relapses follow the operations of Bassini and Halsted because so much destruction of the normal muscular tissue has taken place from the long continuance of the condition that it is impossible, by these methods, to sustain the pressure from within. It is also due to the fact that there is no effort made on the part of the surgeon to reproduce the tissue which has been destroyed by pressure, and to prevent the stretching of the connective tissue which always results from wound-healing. McBurney's operation has also been followed by the most lamentable relapses. The follow-

ing procedure proposed to insure the reproduction of large masses of inflammatory material to restore the abdominal parietes: 1. The introduction of a fine silver wire-filigree throughout the entire inguinal canal, over the transversalis fascia, which adds to the strength of the weakened abdominal parietes and prevents the new material from stretching. 2. Cutting off the hernial sac, and re-treating from the operation exactly as from any abdominal operation, stitching up the peritoneum and transversalis fascia with a continued suture of fine silver wire. 3. The use of fine silver wire with a continued suture. Sterilization of the wire, after it has been thoroughly boiled or steamed, is obtained by immersing it into pure carbolic acid a few minutes before the operation, dipping in alcohol, then holding it over an alcohol-lamp until the alcohol is burned off. Drainage should be avoided if possible; but if necessary in thick, abdominal walls with much fat, a glass drain may be used. Phelps (Med. Record, Feb. 2, 1901).

Inguinal Hernia in the Female.

The operative treatment of inguinal hernia in the female has received but little attention from most surgeons. Championnière was the first to urge it. His method was to excise the round ligament with the sac; but this we believe to be entirely unnecessary and not without objection. The method we have employed has been practically Bassini's method for the male, with the single step of the transplanting of the cord omitted. The incision through the aponeurosis is the same; the same tissues are included in the deep layer of sutures. The round ligament can, in all cases, be freed from the sac, and when this has been done and the sac has been dissected high up beyond the internal ring, it is ligated and excised; the ligament is allowed to drop back into its original place and the tissues are sutured over it. In the deep layer interrupted sutures of

kangaroo-tendon are employed, and in the aponeurosis a continuous suture of the same material.

[Including adults, Dr. Bull and I have operated upon 100 cases of inguinal hernia in the female. Of these 53 were adults and 47 children. Of the adults, 23 were well upward of 2 years; 15 from 1 to 2 years; 5 not traced; 8 operated on less than 1 year. Of children, 17 were well upward of 2 years; 26 were well over 1 year. Total female adults and children, 60 cases were well over 1 year; 40 cases were well over 2 years. WILLIAM B. COLEY.]

Feminine hernia of every type, unattended with organic changes or complicated by serious internal disease, should be treated by surgical intervention. As this is quite invariably free from danger in the non-strangulated, and the prospects of permanency in effects are greater than in the male, it may be generally recommended.

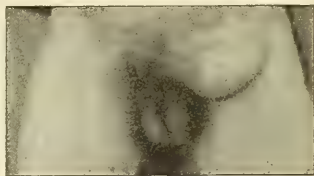
For the "hernial condition," the wide diastasis of the median raphe, or extensive atrophic changes in the lateral muscles of the abdominal walls, with the resulting "pot-belly," surgery can accomplish little, if anything. The treatment of this infirmity must be prophylactic. The pregnant woman with a marked tendency to a sagging forward of the abdominal walls should be girded up by a properly adjusted circular support; and when labor is violent or very protracted, muscular overstrain should be relieved by the use of the forceps or manual support of the overdistended abdomen. Thomas H. Manley (N. Y. Med. Jour., Dec. 23, '99).

Femoral Hernia.

In this variety of hernia the bowel protrudes through the femoral ring underneath Poupart's ligament. It penetrates the crural femoral or crural canal, the small space extending from the femoral ring to the saphenous opening of the fascia lata. On its inner side is Gimbernat's ligament; on the outer the femoral vein and its floor, as found by the pubes, covered by the pectineus

muscle. The peritoneal sac of a femoral hernia is always acquired. When it advances beyond the saphenous opening it usually becomes much larger. The hernia proper is formed by the skin, the superficial fascia, the cribriform fascia, the sheath of the vessels, the septum crurale, and the peritoneum. Its neck is at the femoral ring, where constriction occurs from the edge of Gimbernat's ligament. Although generally small, it occasionally attains large proportions. Besides intestine, the omentum is often found in the hernial cavity.

Femoral hernia seldom occurs before puberty, and is much more common in women than in men.



Femoral hernia.

DIAGNOSIS.—When a femoral hernia is not strangulated, an impulse may be felt when the patient coughs. The tumor is generally tense, small, and round, and can be pushed to the outside of the spine of the pubes.

Inguinal Hernia.—From this variety the distinction is sometimes difficult, especially in women; but the neck of a femoral hernia is always *below* the spine of the pubes and to the outer side.

Enlarged Lymphatic Glands.—These possess no neck, and several glands more or less enlarged can often be felt. Gurgling cannot be detected; fluctuation through the presence of pus sometimes renders the diagnosis difficult.

Psoas-abscess.—Gurgling is also ab-

sent, but cough also causes an impulse, and the abscess often disappears as in hernia when the recumbent position is assumed. Spinal symptoms usually complicate such cases, however. If a psoas-abscess, deep pressure in the iliac fossa will detect the tumor after apparent reduction.

Varix of the femoral vein is sometimes misleading, but pressure over it from below upward, sliding the finger over the vein until the femoral ring is reached, causes it to become emptied, but it may be seen to quickly refill from below,—the differential feature.

Cysts are reducible, but coughing produces no impulse.

Lipomata are bosselated, have no impulse on coughing, and are more doughy to the touch.

Hydrocele and a thickened empty sac are difficult to differentiate, and sometimes require an exploratory incision.

Treatment of Femoral Hernia.—REDUCIBLE.—An appropriate truss involving the principles as to pressure, etc., already outlined, should be employed. A truss is not curative in the case of femoral hernia, however, and is often held in place with considerable difficulty. It should press diagonally upward toward the spine. Compression of the femoral vein, which lies externally to the hernia, must be avoided.

STRANGULATED.—A strangulated femoral hernia may sometimes be reduced by taxis when the thigh is flexed and rotated inward, which position causes the saphenous opening to be relaxed peripherally. No excessive compression or upward pressure should be exercised, however, operation being less hazardous than such a proceeding.

Radical Operation for Femoral Hernia.—Until very recently femoral hernia has been regarded as less amenable to radical

cure than inguinal; but the statistics would tend to disprove the correctness of this idea.

Numerous methods have been from time to time brought out; many of them are complicated and the majority of them have been supported by a very small number of cases. The inguinal method for the cure of femoral hernia, in which the opening is made in the inguinal canal and the femoral opening closed within the abdominal cavity, has been employed by a number of surgeons. It is, I believe, unnecessarily complicated, and, as long as almost perfect results can be obtained by the simpler methods, I think it should have no place in surgery. There is the additional risk not only of having a recurrence in the femoral region, but through the opening made in the inguinal canal. Various osteoplastic operations have been introduced by means of which the femoral opening is closed by a bony flap. Most cases of femoral hernia, I believe, can be cured by one of the two following methods: 1. Pulse-string suture of kangaroo-tendon. This suture is introduced first through Poupart's ligament, the outer part of which forms the roof of the crural canal, then passes through the pectineal fascia, the fascia over the femoral vessels, and lastly upward through Poupart's ligament, emerging about $\frac{1}{4}$ inch from the point of entrance. When this suture is tied it brings the floor of the canal into contact with the roof and completely closes the opening. It is very important to thoroughly free the sac before applying the ligature. I have employed this method in 25 cases with not a single relapse, and 10 cases were traced from 2 to 6 years. This method I believe sufficient for femoral hernia in children and the great majority of adults.

If the opening is very large Bassini's

method, which has given such admirable results for femoral hernia, may be employed.

An incision is made parallel with Poupart's ligament and over the centre of the tumor. This is the same incision that I employ in the purse-string suture. The sac is dissected free from the canal and ligated as high up as possible; with a curved needle six or seven sutures are inserted so as to unite Poupart's ligament with the pectineal fascia, thus accomplishing the same object that the purse-string suture does. The first suture is placed near the spine of the pubis; the second half a centimetre externally; the third one centimetre from the femoral vein, and the remaining sutures are so placed as to bring together the anterior and posterior walls of the canal.

Umbilical Hernia.

VARIETIES.—Three forms of umbilical hernia are usually recognized: the *congenital*, due to faulty union of the visceral plates in the middle line; the *infantile*, which occurs soon after birth as a result of yielding of the umbilical cicatrix after separation of the umbilical cord; and the *adult*, which usually presents itself late in life in women who have borne many children.

CONGENITAL UMBILICAL HERNIA.—In this variety the contents can often be seen through the hernial coverings, owing to the thinness of the layers. The hernia, though usually very small, is sometimes quite large from the first, and contains the greater part of the abdominal organs.

Strangulation may occur at the neck through compression of the surrounding tissues, but it has also been caused traumatically by means of the cord applied around the funis at birth, leading to a fatal issue if much intestine is involved.

A fæcal fistula results if but a small portion of gut is lost.

Treatment.—Immediate reduction should be practiced if possible, and retention of intestine insured by the application of adhesive strips over a small pad placed over the opening. Many surgeons advise the immediate closure of the edges of the ring by catgut sutures. The operation is simple and effective.

An operation for the radical cure of umbilical hernia is performed as follows:

1. Transverse elliptical incisions are made surrounding the umbilicus and hernia; this is deepened to the base of the hernial protrusion.
2. The surfaces



Large umbilical hernia in infant.

of the aponeurotic structures are carefully cleared an inch and a half in all directions from the neck of the sac. 3. The fibrous and peritoneal coverings of the hernia are divided in a circular manner at the neck, exposing its contents. If intestinal viscera are present, the adhesions are separated and restitution made. The contained omentum is ligated and removed with the entire sac of the hernia. 4. With forceps the margins of the ring are grasped and approximated; whichever way the overlapping is more easy of accomplishment suggests the direction of closure. 5. For this approximation an incision is made through the aponeurotic and peritoneal structures of the ring, extending one inch or more transversely to each side, and the peri-

toneum is separated from the under surface of the upper of the two flaps thus formed. 6. Beginning from one to one and one-half inches above the margin of the upper flap, three or four silver wire mattress sutures are introduced, the loop firmly grasping the upper margin of the lower flap; sufficient traction is made on these sutures to enable peritoneal approximation with running suture of catgut. The mattress sutures are then drawn into position, sliding the entire lower flap into the pocket previously formed between the aponeurosis and the peritoneum above. 7. The free margin of the upper flap is fixed by catgut sutures to the surface of the aponeurosis below, and the superficial incision closed in the usual manner. The later approximation is carried out by sliding one side under the other in the same manner. In the larger herniæ the incision through the fibrous coverings of the sac may be made somewhat above the base, thereby increasing the amount of tissue to be used in the overlapping process. W. J. Mayo (Annals of Surgery, Aug., 1901).

INFANTILE UMBILICAL HERNIA.—This form of hernia, though freely met with, never leads to strangulation, and quickly subsides by contraction of the opening if, after reduction, appropriate retentive measures are resorted to.

Treatment.—The hernia should be reduced, then held in place by means of a cork pad wrapped in cotton wadding, held *in situ* by adhesive strips. When these irritate the skin, or the hernia seems rebellious, a light truss can be utilized instead.

Umbilical hernia in children, as a general rule, gets well with the use of a truss. Strangulated umbilical hernia is to be operated on like any other hernia. Radical umbilical hernia is to be operated on if the patient will give consent. Otherwise a well-fitting truss is to be constantly worn, day and night. Irreducible hernia is to be operated on unless there is some marked contra-indication, like serious kidney or heart lesion.

Age and size of tumor need be no bar to an operation. The operation to be preferred should combine rapidity of action with diminution of shock, both by diminishing the hæmorrhage and also the length of time the patient has to be under an anæsthetic. The use of cocaine when ether is contra-indicated. W. H. Conant (Boston Med. and Surg. Jour., Oct. 9, 1902).

ADULT UMBILICAL HERNIA.—This variety of hernia protrudes through the linea alba, not far from the umbilicus, and is generally observed in stout people, especially in women.



Large umbilical hernia.

Umbilical hernia in the adult may attain enormous proportions, hanging down like a large pouch if allowed to go untreated. The omentum, transverse colon, and small intestines may all be found in it.

Treatment.—When reducible, the hernia is held with difficulty by trusses, especially in large subjects. A broad belt with a pad fastened to it is sometimes more effectual. It is frequently irreducible, however, and is prone to inflammatory manifestations. When it cannot be reduced, it is best to protect it by means

of a cup-shaped pad held in position by a bandage or a belt.

This variety of hernia is also liable to become obstructed, a complication occasionally leading to strangulation. There is local disturbance and sometimes pain; vomiting sets in and the other manifestations of strangulation already described present themselves.

Taxis should be tried and, if care be taken to empty the hernial intestines of all gas by gentle pressure, often succeeds. If it should not, however, the proclivity of the hernia to rapidly become gangrenous, owing to compression of its vascular supply, renders an immediate herniotomy advisable.

When operation becomes necessary, the skin should be divided over the orifice, remembering that the sac is exceedingly thin and that it may readily be penetrated. Adhesive inflammation often causes the contents to be adherent, another complicating circumstance. To overcome the constriction without opening the peritoneum should be the first aim; if this is impossible, a couple of shallow incisions through the fibrous ring at its lower border from the inside of the sac will generally make it possible to reduce the strangulated loop. The adherent omentum should then be liberated, ligated, and removed, and its stump returned. After freshening the pillars of the ring and suturing, the wound should be closed and drained. Should the gut be gangrenous an artificial anus is the only resort.

The radical cure of umbilical hernia in adults has been so unsatisfactory that most writers still advise that the hernia should be retained by a pad if still reducible, and supported by a suspensory bandage if irreducible, radical cure only being attempted when operation is necessitated by strangulation. The unsatisfactory results are due to the great ten-

sion which attends the closure of the ring, it being impossible in many cases to oppose at all the fascia constituting the margins of the ring. The best results have been obtained by splitting longitudinally the inner margins of the sheaths of both rectus muscles and subsequent suture of the abdominal wall in layers, the peritoneum and overlying fascia being first united, then the two recti muscles, then the anterior sheaths of the latter, and, finally, the skin. This is the operation described by Tillmanns. It must be remembered, however, that in many cases it will be found impossible to unite the anterior sheath of the rectus muscles after splitting in the way described, or at least such union would be possible only under great tension, which in all probability would defeat the ultimate success of the procedure.

It might be found possible to modify the operation detailed above by dividing the anterior sheaths of the rectus muscles vertically an inch or more from the ring borders. The strong fascia obtained in this way would then be turned over across the aperture, the inner sides of the flaps becoming the outer sides as they were sutured in place. The freed recti muscles could then be brought in apposition as before. Closure could be effected in this way without any tension. The wall over the recti muscles would be weakened; but as the rectus has here a posterior sheath, this weakening would not be serious. J. B. Bullitt (*Annals of Surg.*, Nov., 1900).

Ventral Hernia.—"Ventral" is a general term applied to herniæ occurring in parts of the abdomen other than the umbilicus, especially those following operative procedures, such as laparotomy. It may also result from abscess of the abdominal wall, defective development, muscular rupture, etc. Strangulation is rarely witnessed, owing to the nature of the orifice. Its treatment is that recommended for umbilical hernia.

The results of operation for the radical cure of umbilical and ventral hernia have been more or less disappointing.

[Dr. Bull and I have operated upon 34 cases of umbilical and ventral hernia; of these 15 were ventral, including 3 epigastric and 11 hernia following laparotomy; 4 following appendicitis operations in which the wound had been left open. In the total number of cases of umbilical and ventral hernia there were 12 relapses out of 21 cases traced; 9 relapsed during the first year; 3 of the umbilical were strangulated, with 2 recoveries. WILLIAM B. COLEY.]

The large percentage of relapses occurring in umbilical hernia is explained by the fact that these cases are mostly very unfavorable for radical cure. They are stout women in middle age with a great abundance of fat and very little muscular tissue in the abdominal wall.

EPIGASTRIC HERNIA.—This is a general term applied to forms of hernia occupying the space between the end of the sternum and the umbilicus. These tumors are sometimes discerned with difficulty and are apt to cause symptoms usually referred to gastric disorders.

In young persons suffering from gastric disorders a careful examination sometimes reveals the presence of small tumors, no larger than a hazel-nut, in the linea alba, between the ensiform appendix and umbilicus, at the site of an *inscriptio tendinea* in the rectus. These hernial protrusions usually contain omentum, and, as the sac cannot readily be felt, the tumors may be mistaken for lipomata of the abdominal walls. They give rise to severe pains and vomiting. The radical operation for hernia causes a complete disappearance of the disturbances. Von Bergmann (*Wiener med. Woch.*, No. 5, '91).

Especial attention called to hernia in the linea alba. These are often very small, varying in size from a pea to a walnut, usually above the navel, may be multiple, and occur generally in men from 20 to 50 years. All the author's twelve cases were among the working-classes. They are most apt to contain only subperitoneal fat, but may consist of omentum or intestine. The symptoms

are the same in any case. These are very various. There may be no disturbance at all, or the symptoms may come on suddenly and be more severe. In the typical case there is colicky pain, increased by pressure, radiating toward the shoulder or giving the girdle-sensation; there are generally recurring attacks of pain and vomiting. Kuttner (*Mitteilungen aus der Grenzgebieten der Med. und Chir.*, vol. i, No. 5, '97).

Epigastric hernia should include all herniæ which are found in the area bounded above by the xyphoid cartilage, below by the umbilicus, and on the sides by the cartilages of the ribs. They so commonly appear in the linea alba in comparison with other sites that they have been termed "hernia in the linea alba." In a series of 16,800 cases of all varieties of hernia examined by Berger there were 137 cases of epigastric hernia, some of the cases occurring alone, some in combination with other forms of hernia. It is very exceptional to find these cases in subjects less than 18 years of age, and most of the subjects of such a form of hernia are between 25 and 50. Astley Cooper, however, reported 2 congenital cases, and some few cases have been reported as beginning in early childhood. The vast majority of cases are in males of the working-class. As a rule, the onset is insidious. The patient complains for some time of stomach-symptoms before the hernia appears externally or when the hernia is so small as to escape detection without a careful examination. In not a few cases, however, there has been a traumatism, followed by very acute local and general symptoms, and the tumor has appeared within a few hours. Lothrop (*Boston Med. and Surg. Jour.*, Feb. 25, '97).

The size of the hernia and the consequent disability are of much interest, the herniæ ranging in size between that of an egg and a child's head. The weakness and discomfort caused by these herniæ are very much the same as in hernia following laparotomy.

Observation of 1000 cases of laparotomy done in the hospitals in Berlin,

showing that nearly one-third of all the cases suffer from ventral hernia. In some cases the hernia does not develop for one or two years after the operation. Winter (*La Semaine Méd.*, June 15, '95).

In regard to the treatment of such cases, much depends on the age of the patient, as well as upon the character of the abdominal wall. As a rule, these patients are young adults with good abdominal muscles, little accumulation of fat, conditions the contrary of which is usually found in umbilical hernia and which so often contra-indicate operation.

The results of operations for epigastric hernia are very satisfactory. The same is true of cases following appendicitis. Of four cases not one relapsed, though the herniæ were of large size and adhesions were present.

Cæcal Hernia.—This form of hernia is far more frequent than is generally supposed. I have observed it 16 times in 531 operations. In a number of cases the cæcum could be reduced, but the appendix could not, on account of adhesions to the sac. Cæcal hernia occurs usually on the right side, but may be found on the left. I have operated upon one left inguinal hernia in which the sac contained a large, vermiform appendix. The patient was 10 years old. In the majority of cases, especially in young subjects, the hernia is congenital.

Strangulated hernia of the cæcum in any form is infrequent, the number of cases met with in a large series of 565 herniotomies amounting to only 1.59 per cent. Extreme rareness of uncomplicated cases of this form of strangulated hernia noted, two instances only being found in this same series. The very high rate of mortality (66.6 per cent.) was clearly due to the critical condition of the majority of the patients at the time of operation. Bennett (*Lancet*, Feb. 1, '90).

Rare Forms of Hernia.—**DIAPHRAGMATIC HERNIA.**—This form may be *con-*

genital or acquired. The congenital form is due to imperfect closure of the diaphragm and the protrusion into the pleural cavity of a portion of the abdominal contents. This occurs by the side of the ensiform cartilage, between the xiphoid and costal portions. A diagnosis of this condition is hardly obtainable.

Case of diaphragmatic hernia in male child, 3½ years of age, showing the following points of interest: 1. The physical signs in this case were identical with those of empyema. 2. The frequent high temperatures, for which there was no apparent cause except constipation. Lynde (*Archives of Pediatrics*, Dec., '89).

Case of congenital diaphragmatic hernia diagnosed during life. The patient was 14 months old. Percussion was dull on the left side of the chest and vesicular murmur was absent; posteriorly on the left side interstitial gurgling could be heard at times. When the child was inverted the lower part of the left chest became tympanitic and the note on percussion varied between tympanitic and dull, with variations in positions at different times. In consequence of the development of vomiting, constipation, and collapse it was thought that some strangulation had possibly occurred and abdominal section was performed. All the intestines were found in the left chest, but were not strangulated. The child died. There was a semicircular deficiency in the posterior part of the left leaflet of the diaphragm 2 inches long. The spleen was in the left pleural cavity; the left lung was completely undeveloped. The peritoneum was continuous with the pleura round the opening. Jeffreys Wood (*Lancet*, Apr. 16, '98).

The acquired form may be due to rupture of the diaphragm through violent effort, direct violence, or penetrating wounds. The penetration through the opening thus formed suddenly creates dyspnoea and asphyxia, besides other manifestations which the displacement of organs give rise to according to the site of the tear or laceration in the dia-

phragm. Excessive thirst has been noted by Bryant as a prominent symptom.

Case of diaphragmatic hernia in which the author performed laparotomy. Nearly the whole sigmoid flexure and the large omentum had disappeared through the diaphragm. All the efforts to effect a replacement were useless, either through the stomach turning on its axis or the sigmoid flexure. The patient died the day after the operation. G. Naumann (*Hygieia*, Aug. 8, '88).

Pneumothorax, the affection with which diaphragmatic hernia is likely to be confounded, results from pulmonary tuberculosis in 90 per cent. of all cases, and in probably all of these is speedily followed by effusion of serum or pus into the pleural sac. The affection develops without the history of an injury. In the remaining 10 per cent. nearly all result from traumatism, and in most of these inflammation of the pleura speedily follows with effusion of fluid, though in a very few there may be no infection and the air may be absorbed without causing any effusion. In pneumothorax dyspnoea may come on suddenly or gradually and one may often hear amphoric respiration, especially in expiration, which may be either intense or feeble and which disappears when fluid rises high enough to cover the opening into the air-passages. When fluid and air are present in the pleural cavity, metallic tinkling may often be heard during the respiratory acts and distinct splashing sounds may be obtained by shaking the patient's body while the ear is applied to the chest. The heart is constantly crowded to the opposite side, where it remains without variation. Diaphragmatic hernia is congenital or occurs through congenital defects in about 38 per cent. of the cases that have been recorded, and in many of these it does not cause marked symptoms unless the hernia becomes strangulated. In about 60 per cent. of cases the affection is traumatic, and therefore the history is quite different from that of pneumothorax. The dyspnoea in hernia may come on suddenly and as suddenly subside, whereas

that of pneumothorax is more continuous. E. Fletcher Ingals (*Jour. Amer. Med. Assoc.*, June 22, 1901).

PROPERITONEAL, OR INTERSTITIAL, HERNIA.—There are three varieties of interstitial hernia classified according to the relative position of the sac:—

1. In which the sac lies between the peritoneum and the transversalis fascia. This variety is very rare. A tumor is seldom present, and the condition is not often recognized until strangulation has occurred.

2. In which the sac lies between the external and internal oblique muscles.

3. In which the sac is external to the aponeurosis of the external oblique.

In the last two varieties there is a well-marked tumor which is situated in the inguinal region, but seldom extends into the scrotum. While the mode of formation in many cases is difficult to explain, in most cases the condition is associated and probably dependent upon undescended or partially descended testis. In the rare cases of this variety of hernia observed in women it has been associated with a hydrocele of the canal of Nück; the undescended testis or the hydrocele, furnishing an obstruction to the further progress of the hernia in the downward direction, causes it to enlarge upward, and, following the line of least resistance, the sac may find its way to the situations already described.

The conditions which may simulate this form of hernia are: a cold abscess from spinal or pelvic bone disease, or hydrocele of the cord. The only form of treatment to be recommended is operative interference.

LUMBAR HERNIA.—This rare form of hernia emerges in the region of Petit's triangle, after passing through the lumbar fascia near the quadratus lumborum, and may result from strains, wounds,

abscesses, or may appear spontaneously, especially in people of advanced age. It is easily reduced and retained by an appropriate belt.

Record of 29 cases of lumbar hernia. The small triangular space bounded by the external oblique and latissimus dorsi muscles and the crest of the ilium (Petit's triangle), it is generally assumed, constitutes a relatively weak spot in the abdominal wall, and that hernial protrusion may occur here, but that strangulation of the contained intestine is very unlikely to develop. Out of the 29 cases 16 developed spontaneously, or were attributed to strain, and all were in adults or elderly subjects. Males and females appear to be equally liable to lumbar hernia. Seven cases of apparently spontaneous origin were on the left side, 4 on the right. In 6 cases (about 20 per cent.) the hernia followed in the track of a previous abscess or sinus—4 in males and 2 in females. In 5 cases the hernia was due to wound or other severe traumatism of the loin, and 2 were reported as congenital. A well-made abdominal belt is efficient in preventing protrusion. Hutchinson (Brit. Med. Jour., July 13, '89).

Study of lumbar hernia in 53 reported cases. Lumbar hernia divided into four groups,—those due to traumatism, those following abscesses, those which are spontaneous, and those which are congenital; 19 cases followed traumatism and 19 followed abscesses, the majority occurring through Petit's triangle. The congenital variety is due to lack of ribs or part of the abdominal wall. These conditions must be differentiated from pseudoherniæ,—hernia-like ectasia of the abdominal wall, due to weakness and atrophy of the abdominal muscles. Borchardt (Berliner klin. Wochen., Dec. 16, 1901).

HERNIA INTO THE FORAMEN OF WINSLOW.—This variety, though very rare, is of special importance, because it frequently gives rise to intestinal obstruction. It cannot be recognized without abdominal section; but treatment of the

intestinal obstruction by enemata sometimes succeeds in bringing about the reduction by causing distension of the gut and traction upon the engaged loop.

In a case of hernia into the foramen of Winslow abdominal section was performed, and the nature of the trouble determined, although reduction could not be effected. Forty-eight hours later, after a large enema, the symptoms subsided and a rapid and complete convalescence set in. A. Neve (Lancet, May 28, '92).

ISCHIATIC HERNIA.—This term is applied to protrusions taking place through the lesser sciatic notch, those through the greater being called *gluteal*. It may occur on either side, and may be either congenital or acquired. It has been seen more often in females. Its contents may be bowel, ovary, or a diverticulum of the bladder. Incarceration of a portion of bowel along with an ovary has been observed in three cases. Ischiatic hernia is extremely rare (Garré).

In all cases of perineal vagino-labial hernia the hernia issued from the pelvis, out of the perineum, and distended the labium majus. Three varieties distinguished.

In the "anterior" form the sac protrudes between the sphincter vaginae and the erector clitoridis. In the "median" form it bulges between the sphincter vaginae and the deep transversalis perinei. In the "posterior" form the hernia passes between the levator ani and the gluteus maximus. The abdominal orifice of the sac lies in front of or behind the lateral true ligament of the bladder. The best treatment for all forms of perineal hernia in women is a radical operation, which must be performed from the perineal aspect, the sac being exposed by an incision through the vulvar structures. Winckel (Annales de Gynéc. et d'Obstet., Aug., '90).

PERINEAL HERNIA.—In this form the protrusion occurs between the fibres of the levator ani in front of the rectum; it descends behind the bladder

in men, and the vagina in women. It occurs oftener in the latter than in the former and often penetrates the labium majus, forming the labial, or pudendal, hernia. A true labial hernia also occurs, the sac descending between the ramus of the ischium and the vagina into the posterior portion of the labium.

It may be mistaken for Bartholinian abscess and labial cyst, but the inflammatory manifestations of the former and the absence of gurgling in the latter generally render a diagnosis easy.

Winckel, who found 6 cases in 5600

procedures are to be resorted to. It is seldom recognized and may be mistaken for femoral hernia.

Its situation causes it to manifest itself in the majority of cases as an indefinite bulging or fullness of the tissues of the region, and careful palpation sometimes causes gurgling. It is usually met with in spare women past middle age and subsequent to the menopause. Men less frequently suffer from this variety of hernia. It is rarely distinguished before strangulation occurs. Pain down the leg along the obturator nerve is a distinguishing



Labial hernia.

patients examined by him, recommends a radical operation through the perineal tissues.

OBTURATOR HERNIA.—This is a rare variety of hernia, which protrudes through the obturator foramen between obturator externus and pectineus, pushing before it the obturator fascia. The femoral artery and vein pass externally and in front of it, the adductor longus forming the opposite wall. The obturator artery and vein may lie to the inner or outer side of the hernia, especially near the neck: anatomical features which should be borne in mind when operative

feature, in addition to the usual signs of strangulated femoral hernia.

Taxis is sometimes successful, especially if the thigh is flexed, adducted, and rotated inward. The muscles and tissues around the hernia are thus relaxed. If this fails, herniotomy should be performed, the nature of the vascular supply and the fact that the constriction is at the neck of the sac—which should be incised by cutting downward—being borne in mind.

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HERPES.—Gr., ἔρπω, to creep.

Definition.—Herpes simplex is an acute, non-contagious, benign disease of the skin, usually dependent upon a neuritis of the nerves supplying the part, and characterized by an eruption of vesicles in groups upon an inflamed, cedematous base.

Herpes simplex may attack any part of the body-surface, but the malady shows a decided preference for two localities. These parts are the facial and genital regions. Because of the usual distinct restrictions of the disease to one or the other of these sites, and the diversity in symptoms that is liable to be manifested, two varieties of the disorder have been distinguished, and to each has been given a separate title. They are called *herpes facialis* and *herpes genitalis*. While essentially the same in nature, the specific causes apt to produce them, the dissimilarity of their manifestations, and the various diseases with which they are likely to be confounded, make their individual description a matter of necessity.

Herpes simplex appears but rarely in other situations upon the body and still less likely is it to occur in a generalized form. When such does happen, the term "herpes generalis" is applicable.

[Our etiological and pathological knowledge of the affection is still too limited to enable us to demonstrate with absolute certainty that there is always a preceding or accompanying neurosis, but evidence enough is at hand to warrant our accepting this statement as the truth. The almost constant distribution of the lesions in the course of certain nerves points definitely to such a conclusion. WILLIAM FRANCIS ROBINSON.]

Symptoms.—Herpes facialis may occur upon any part of the face or forehead.

Case of herpes affecting simultaneously the ophthalmic and the auriculo-

temporal nerves. Vesicles appeared in the area supplied by the left frontal nerve, groups being present over the eyebrow, near the median line, close to the hair, and near the temple. The eyelids were reddened and swelled. Later, vesicles developed upon the left tympanic membrane. Bonnier (Jour. of Laryn., June, '93).

Two instances of herpes ophthalmicus associated with paralysis of the ocular muscles observed. The first case occurred in a man aged 58 years, the third and fourth, sixth, and first divisions of the fifth nerves being involved. In the second case (a man 79 years of age) there was complete ophthalmoplegia externa, proptosis, and a glaucomatous condition of the eye, with hypæmia. The first case was benefited by iodide of potassium. Silcock (Clinical Jour., Aug. 8, '94).

The vermilion border of the lips, also of the nose, upper lip, cheeks, and auricles are favorite sites for its appearance. The mucous membranes of the mouth and throat are often implicated. So, too, the disorder may attack the cornea.

Case of stubborn, recurrent, herpetic disease of the conjunctiva and cornea, in conjunction with menstrual disturbance of the menopause, cited. The disease took the form of a small loss of corneal tissue, with fatty, uneven edges, and resembled a phlyctenule in appearance. Its summit had undergone ulceration. The eruption differed from that which is characteristic of herpetic disease by its disposition and appearance. Stuelp (Archiv f. Ophth. [Gräfe], B. 40, H. 2, '94).

At the outset a slight tingling or burning is felt in the part about to be attacked. Redness and swelling rapidly follow, and upon this cedematous base a cluster of tiny vesicles soon appears. Usually an areola surrounds the group. The groups vary in number from one to a half-dozen or more, and in size from the surface of a split pea to a silver

twenty-five-cent piece. They are round, oval, or irregular in outline, and may be closely set or widely separated. The vesicles are from pin-head to a kernel of wheat or larger in size and number three to a dozen or more in each group. They are fairly firm to the touch and do not readily rupture. Most authors describe a preceding papular stage. This is exceedingly hard to demonstrate, and, if it does exist, is of very short duration. With care in the examination, fluid may be found in the lesions at the moment of their inception.

At the outset each vesicle is filled with clear, transparent serum. This gradually grows turbid, until by the end of the second or third day, if the lesion be not sooner ruptured, the liquid assumes a milky condition, and examination under the microscope shows an abundance of pus-cells and degenerated epithelium. Where closely set the vesicles may coalesce, forming a flat-topped bleb.

Unless interfered with, the vesicles run their course in from four to ten days, the process then being completed by the formation of a crust which desiccates and falls, leaving a brownish, pigmented spot. This pigmentation gradually disappears without forming a scar or other relic of the disease.

If the vesicle, as usually happens, is broken by picking, rubbing, or scratching, an excoriation results, which, if it does not become infected, is shortly covered with a crust, and the disease then runs its usual course and terminates in the ordinary way. Such crusts are dry and firmly attached. When the excoriations become infected with pus-cocci or are treated with strong caustics, grave ulcers are apt to supervene and disfiguring scars remain.

Hæmorrhage into the vesicle (black

herpes) and gangrene sometimes complicate the process.

Subjective sensations are usually slight. The unsightliness of the disease causes the patient more distress than does the pain of the disorder. The tickling, burning, or pricking sensations occurring at the outset may continue for a day or two and then subside, no further distress being experienced. Sometimes, though rarely, more or less itching is complained of, and even pain is occasionally felt.

Herpes of the mouth and throat (canker spots) presents a somewhat different appearance. Owing to the moist, warm condition of the parts the vesicles cannot develop as such. A round or oval patch, slightly elevated, and covered with a whitish, sodden exudate, is first formed. These spots may be situated upon the upper or under surface of the tongue, the border of the gums, the inner wall of the cheek, the palate, or the tonsil.

Case of chronic recurrent herpes of the oral cavity seen in a man of 38, healthy until his eighteenth year, when, after an attack of typhoid fever, in 1874, the herpetic trouble began to show itself,—at first upon the lips and along the gums, later on the tongue. The eruption lasted from eight days to four weeks. In 1888 and 1889 for nearly a year the patient was free from herpes. After this, however, the attacks recommenced with greater frequency, sometimes immediately following one another. The patient complained of difficulty of breathing through the nose during the attacks. No general symptoms accompanied the attacks; the pharynx and larynx remained free. Salivation was a marked symptom from time to time, and the mucous membrane of the cheeks was attacked.

The immediate cause of the affection seemed to be some involvement of the trigeminus. Flatau (Deut. med. Woch., May 28, '91).

The most frequent site of herpes of the larynx is upon the posterior face of the epiglottis, and in the neighborhood of the arytenoids.

It is characterized anatomically by the evolution in these regions of herpetic vesicles surrounded by an inflammatory zone, and clinically by the symptoms peculiar to herpetic fever, and also by painful dysphonia, rawness of voice, occasionally aphonia, sometimes dyspnoea.

Its invasion is abrupt, its course rapid, prognosis favorable, and cure complete. Relapses sometimes occur.

Rarely it is accompanied by phenomena analogous to those of croup. Brindell (*Rev. de Laryn.*, xvi, p. 233, '95).

Herpes of the mouth, while not always severe, usually occasions considerable distress.

A condition that is known as "herpetic fever" is occasionally met with. The disease usually occurs in epidemics and is characterized by languor, vomiting, and chilly sensations, followed by a rigor and then a sudden attack of fever. The fever may run as high as 104°; the tongue is moist and heavily coated; the throat is sore, and the glands of the neck enlarged. Restlessness and delirium are exhibited at night. On the second day the vesicles appear and are usually confined to the face. Crocker speaks of defervescence being associated in some cases with the herpetic outbreak.

The disease runs its course in about four days, terminating in recovery.

The course of the disease and its occurrence in epidemics points to an infectious origin. Cases have been traced to sewer-gas and faulty hygiene.

[Epidemics have been reported by Savage (*Lancet*, Jan. 20, '83) and Seaton (*Clin. Soc. Trans.*, vol. xix, p. 26, '86).

WILLIAM FRANCIS ROBINSON.]

Diagnosis.—Herpes facialis is to be distinguished from ECZEMA by the larger size and greater stability of the vesicles, by

their peculiar grouping, the insignificant sensations accompanying the disease, and the rapidity with which the disorder runs its course. There is no weeping, as in eczema, and no successive new formation of vesicles upon the same sites. The resemblance of herpes, when the lesions have broken and crusts have formed, to IMPETIGO is sometimes marked. But in impetigo the crusts have been preceded by a single vesicle, bleb, or pustule. Instead of a group of vesicles, the patches of disease are not distributed in the line of any cutaneous nerve, but are scattered irregularly over the surface, and typical lesions can usually be found upon the hands and also upon the trunk. There is often a history of contagion. Care must be exercised in not confounding herpetic lesions of the mouth with the mucous patches of syphilis. Many patients, frightened by the knowledge of their exposure to syphilitic infection, point to their frequently recurring cancer spots as indubitable proof that they possess the disease. More decisive evidence in the form of scars, alopecia, gummata, or the peculiar eruptions of syphilis must be searched for and found before confirmation of the subject's fears should be given. Veterans of syphilis are sometimes subject to herpetic troubles of the mouth that give rise to much mental distress on the part of the patient, but which are not in any wise related to the precedent lues.

Herpes occurs at all stages of pneumonia, and is dependent rather upon the peculiar liability of the subject to herpes than upon the nature of the case. Prognosis is better in cases in which the eruption occurs. Talamon (*Rif. Med.*, Mar. 20, '95).

Buccal herpes must be differentiated from mucous patches. Buccal herpes is much more painful and much more liable to become fissured. It has from the outset a marked milky tint, and long pre-

sents in the centre of its polycyclic border a whitish circle, which is the last vestige of the broken-down or ruptured vesicle. The microcyclic contour has a positive value. The specific treatment is injurious. Fournier (*Revue Internat. de Méd. et Chir.*, June 25, '96).

Herpes simplex can be distinguished from herpes zoster by the bilateral distribution of its lesions, the presence of fever, and the lack of nerve-pain.

Herpes Facialis (fever-blisters).

Etiology.—Herpes facialis is a common, though not necessary, accompaniment of many fevers and of catarrhal disorders of the nose, throat, bronchial passages, and lungs. The popular designation "cold sore" is indicative of the frequency with which the complaint occurs in simple coryza. Typhoid and intermittent fevers frequently give rise to it. Herpes simplex is very apt to occur in pneumonia not only upon the face, but upon the genitals and at times in other localities upon the body. At one time it was believed to occur regularly at the crisis in all cases of sthenic pneumonia in which a favorable outcome was likely to occur. Such auspicious prognosis, however, can no longer be maintained.

Disturbances of the digestive tract, especially in children, are prone to produce herpes of the lips. Indigestion, gastritis, gastric ulcer, and enteritis in adults are frequently associated with this form of herpes. It is not unusual in malaria, but is said to be rare in relapsing fever. Herpes of the nose and lips often co-exists with tonsillitis and bronchitis.

Some persons are so extremely susceptible to the disease that merely brushing the face or the lips with a feather will induce it. Many women are affected at each menstrual epoch with labial herpes.

Five cases of acute pyrexia occurring between the second and fifth days after confinement or abortion, in each of which the febrile attack terminated by an eruption of facial (usually labial) herpes. In each case the attack was ushered in by rigors; the pyrexia was severe, rising to 103° to 104° F., and in each case, after the appearance of the herpes, the patients rapidly recovered. Attention called to the disquieting nature of these symptoms and their liability to be confounded with those of grave septic infection; when strict antiseptic precautions have been taken in the conduct of labor or abortion, and no local condition can be found to account for the subsequent rigor or pyrexia, it may be well to remember that the explanation of these phenomena may sometimes be found in the occurrence of the herpetic disorder described. Lutaud (*Jour. de Méd. de Paris*, July 12, '96).

Toothache as well as dental instrumentation is known to produce the trouble.

Herpes facialis may be due to irritation of the trifacial nerve reflexed from some dental affection. George Carpenter (*Pediatrics*, May 1, '96).

Blows upon the head, exposure of the face to alternate hot and cold blasts, or the application of irritating medicaments to the parts, are fruitful sources of the disorder. Many cases are thought to arise without appreciable cause, and are spoken of as idiopathic, but it is doubtful if such is ever strictly the truth. A careful analysis would, in all likelihood, reveal in each instance the existence of some irritating factor capable of producing the affection.

Pathology.—Owing to the benign nature of the disease, opportunities for studying its pathology are rare, and our knowledge is correspondingly limited.

[To Unna, of Hamburg, is due much that we know. His observations were

confined to the study of tissue taken from three living subjects affected with herpes genitalis, and one corpse dead of a febrile disease in which facial herpes was present. WILLIAM FRANCIS ROBINSON.]

Unna found that the process originated in the upper layer of the rete mucosum and was a true coagulation-necrosis. The cells affected were much enlarged and the cell-contents were greatly changed. The nucleus had disappeared and the protoplasm could not be stained. This was due to the saturation of the cell by fibrinogenous substance from the fluid surrounding the cell-body. The cell retained its normal shape and the prickles remained intact. Beneath the zone of necrotic tissue a layer of flattened and thinned prickle-cells was found that still retained its normal features and the cells their capacity for staining, thus indicating that the elevation of the whole epithelium was a secondary, and not a primary, occurrence. Deeper down in the rete were cells in a necrotic condition. In most of these the nucleus had disappeared, leaving only a cavity, while in some cell-substance had been completely dissolved in the fluid of the blister. The heads of many papillæ projected into the cavity of the lesion and were entirely denuded of epithelium. It would appear, then, that the process consists of two distinct steps, the first consisting of a fibrinous inflammation of the upper prickle-cell layer, converting it into a nuclear, degenerated, necrotic mass, forming later the roof-wall of the vesicle. The second, the loosening of the epidermis as a whole, with the formation of a subepithelial blister, whose contents again undergo coagulation-necrosis. The blood-vessels and lymph-spaces underneath and about the lesion were found markedly dilated, and

distinct, though not extensive, migration of leucocytes was evident.

Prognosis.—The disease is a benign disorder running its course, if not irritated, in from four to twelve days. No scarring is produced. Pigmentation follows the desiccation of the vesicles, but this soon disappears. The disease is exceedingly prone to recur,—in many patients with almost periodical regularity.

Treatment.—The treatment of herpes of the face should be of the simplest kind. All irritation should be removed. No picking, scratching, or rubbing should be allowed. The smoker should be made to give up his pipe or cigar, and all forms of tobacco had best be interdicted.

Strong acetic acid, if applied at the outset before the vesicles have formed, will often cut short the attack or greatly lessen its severity. The action of the acid should be checked before whitening of the skin takes place. If the itching and burning are at all severe, lotions of dilute lead-water and opium, zinc oxide and lime-water, elderflower-water, camphor-water, or weak ammonia-water may be used freely. These should be followed by a simple dusting-powder, such as starch, boric acid and talc (1 to 8), stearate of zinc, or lycopodium. Painting the parts with flexible collodion after the vesicles have fully formed makes an admirable dressing. Ointments, as a rule, are not well borne. The Lassar paste (salicylic acid, gr. v; zinc oxide and talc, of each, drachma ij; vaselin, drachma iv) makes a good protective covering.

Internal medication for the relief of the disease while in its course is useless. As a prophylactic, according to Duhring, arsenic is of positive value, and will cure the tendency to the disorder. It should be given in full doses: $\frac{1}{20}$ grain

of arsenous acid four times a day, or Fowler's solution, 3 to 7 minims, after meals. Cold sponging of the body each day, especially of the spinal region, followed by vigorous friction, will help to control the tendency.

Herpes at the orifice of the external auditory canal cured by tonics and the local application of yellow oxide of mercury. L. S. Somers (Amer. Medico-Surg. Bull., Oct. 31, '96).

Treatment of herpes of the cornea consists in weak duboisine and eserine; insufflation of powdered iodoform and cocaine, and the same in ointment once daily; occlusion; galvanocautery, if necessary; and, in infecting progressive ulcer, injections, under the conjunctiva, of antitoxin. Balezowski (Rec. d'Ophtal., June, '96).

Herpes Genitalis.

Besnier has lately given the appellation "genitalis" to all forms of genital herpes, and the term is much to be preferred to the older designations: "pro-genitalis" and "præputialis," neither of which were strictly accurate.

Symptoms.—Burning and itching, with sometimes pain, precede the appearance of the vesicles. Usually there is but one group, but occasionally the number is greater. There are not apt to be as many vesicles in each cluster as is the case in herpes of the face. A reddened œdematous base with a single or at most two or three distinct vesicles upon it is not uncommon. Certain sites upon the genitals seem to be favored by the disease. These, in the order of their frequency in men, are the sulcus, the reflected mucous membrane of the prepuce, the glans, the margin of the prepuce, and the skin on the shaft. (F. B. Greenough.)

In women the sites of preference are the skin of the vulva, the inner border of the labia majora, any part of the labia minora, the prepuce, the clitoris,

and the orifice of the urethra. When the lesions are situated upon the mucous membranes the vesicles rupture early and the patient first notices an excoriation, covered by a whitish deposit. Upon the integument of the vulva or penis the vesicles look like tiny droplets of water. They rapidly lose their clear shining appearance, however, owing to the increasing turbidity of the contents. Crusting follows, and if the disease is not irritated the process terminates by the falling of the scab in from one to two weeks. A pigmented spot remains. This eventually disappears. There is no scar.

In man the genital herpes is located upon the penis; in woman, either at the urethral orifice or upon the vulva. The base of the ulceration is yellow, but its principal characteristics is its microcyclic and polycyclic vesicle. A most important variety is that which, desicating from the centre to the periphery, assumes a papular aspect and resembles sometimes a chancre, sometimes a mucous patch. Herpes may arise suddenly or by successive eruptions. Its duration is variable, lasting from a few days to several weeks. Fournier (Revue Internat. de Méd. et Chir., June 25, '96).

Itching is apt to be severe, especially in women. Neuralgic pain simulating that of zoster is sometimes felt. These cases should be regarded with suspicion, but it is not a wise measure to call every attack of this nature *shingles*.

The lesions in the male are usually situated in the line of the dorsalis-penis nerve. When close set the vesicles may coalesce.

Diagnosis.—The recognition of the disease does not usually present any great difficulty, but care is sometimes needed in arriving at correct conclusions. The mental distress of the patient is generally out of all proportion to the severity of the disorder, and this,

coupled with the ease with which the lesions may be confounded with the initial sclerosis of syphilis, makes the subject a fruitful field for the quack and the unprincipled practitioner. Many a young man has had his life made bitter and has parted with his years of hard-earned wealth because some such scoundrel has pronounced the simple herpetic lesion exhibited a virulent chancre. If the truth might be known many of the wrecks behind the bars of our insane asylums could be traced to this cause. On the other hand, the ease with which syphilitic infection may take place at the site of the herpetic vesicle or excoriation will make the careful practitioner exceedingly guarded in his statements to his patient. He is a physician of very limited observation indeed who has not seen an undoubted case of genital herpes linger along, getting worse instead of better, until it had assumed the classical features of a chancre or chancroid, to be followed by the disastrous results of the one or the other.

In cases of a doubtful nature on or near the genitals one should keep in mind the following points: The chances of irregular herpes should always be considered; the lesions and inguinal glands should be frequently examined until the diagnosis is clear. In the meantime irritants and mercury should not be used. Cooper (*Brit. Med. Jour.*, May, 1900).

If there be a history of exposure to a probable source of infection, sufficient time to exclude the possibility of such infection must be insisted upon before a final answer be given. This, in the case of chancroid, need be but a few days. The pain, the intense inflammation, the formation of a true ulcer, and the development of the single inguinal bubo will tell the story. If haste is necessary the autoinoculability of the secretion may be tried.

If true chancre be expected, at least six weeks from the time of the exposure should be allowed to elapse before a definite decision can be rendered. The sluggishness of the lesion, the induration, the double inguinal enlargements, and the characteristic eruption will distinguish it.

Etiology.—Herpes genitalis occurs in both sexes, but with relatively greater frequency in the male than in the female. In persons subject to the disorder any irritation of the genital regions is likely to induce an attack. Ungratified sexual excitement, local uncleanness, coitus, masturbation, friction with the underclothing, passage in the male of a sound or pressure in the saddle on horseback or the bicycle are common and fruitful sources of the mischief. In some women it appears at each catamenial epoch, preceding, accompanying, or following the period. It is frequent during pregnancy. Venereal disorders, such as gonorrhœa and chancroid, as has been so well shown by Doyon, are apt to induce it. They are not, however, as he endeavors to show, its invariable precursors. Vaginitis and leucorrhœa are prone to give rise to the disease, the irritating discharges acting as the exciting factor. Fournier and Unna have shown that it is very common in prostitutes and lewd women. In women infected by their husbands with syphilis or gonorrhœa it is said to be infrequent.

Herpes genitalis is a disease of early and middle adult life. It rarely occurs in infancy and seldom after fifty years of age. Like herpes of the face, it sometimes appears to arise without appreciable cause. Disorders of digestion and constipation are named as exciting factors, but it is doubtful if such be the case.

A redundant prepuce is unquestionably an exciting element in men. Balanitis is sometimes regarded as a cause, but the probability is that it is due to the same derangements that induce the herpes.

Prognosis.—Herpes genitalis is a disease that recurs with exasperating frequency and occasionally makes life a burden to its victim. But, aside from the tormenting pruritus and the belief in its venereal origin, it is seldom that it gives rise to much that can be characterized as more than mere annoyance. The patient's fears need to be allayed and faulty sexual habits and hygiene corrected. The tendency of the trouble is toward rapid healing. Where ulceration results from the improper use of caustics the process may be much prolonged and phimosis with distinct narrowing of the præputial orifice may result.

Treatment.—Caustics should never be used in the treatment of herpes of the genital organs. Grave ulceration is liable to result and the more important factor of accurate diagnosis is almost sure to be clouded. The simplest antiseptic washes with absolute cleanliness are sufficient. Immersing the parts, where possible, in a warm solution of boric acid, or bathing them with the same twice a day and dusting afterward with euophen or aristol, is all that is needed. Weak solutions of bichloride of mercury, zinc sulphate, or potassium permanganate, may be used. Duhring speaks highly of the following formula:—

℞ Zinci sulphatis, ℥i-3j.
Potass. sulphide, ℥i-3j.
Spt. vini rectificatus, 3j.
Aquæ, f3vij.

M. Sig.: Shake and apply frequently and freely.

All sources of irritation should be removed. Borated cotton makes a good covering.

For herpes pudendalis, an ointment of 30 grains of tannic acid to the ounce of cold cream used, the mixture to be applied frequently during the day. Many cases seem to be of malarial origin and are benefited by quinine and Fowler's solution. Carstens (Phys. and Surg., Oct., '95).

The treatment of herpes is simple. Scratching must be avoided; absolute cleanliness and avoidance of all irritation are imperatively demanded. In the beginning a little lint covered with vaselin is sufficient for genital herpes. Later on, talcum powder or bismuth subnitrate is useful. All measures fail during the acme of vulvar herpes. Cold cream and starch poultices quiet the pain. After the subsidence of this period, baths and inert powders are useful. Buccal herpes calls for nothing but emollient gargles. Fournier (Revue Internat. de Méd. et Chir., June 25, '96).

In dressing the penis no bandage should be used. It interferes with the return-circulation and is liable to induce phimosis. Arsenic may be tried as a prophylactic, and cold sponging of the body should be practiced daily. In persistent cases the use of the faradic current daily over the spine may be tried.

In patients with a long foreskin circumcision should be advised.

WM. FRANCIS ROBINSON, (Chicago) and
CENTRAL STAFF, (Philadelphia).

HERPES ZOSTER (SHINGLES; ZONA).

Definition.—Herpes zoster is an acute inflammatory disease of the skin, appearing in the course of certain cutaneous nerves, accompanied by severe nerve-pain, usually unilateral in the distribution of its lesions and characterized by the occurrence of groups of firm, tense, globoid vesicles rising from an œdematous base.

Symptoms.—The outbreak of the eruption is nearly always preceded by a severe nerve-pain in the neighborhood of the area about to be attacked. Occasionally it occurs at a considerable distance from the part. The onset of the pain is usually sudden. The patient retires at night in apparent good health and after resting well for a number of hours is suddenly awakened by a "stitch in the side." Or after a hearty meal he lies down for an after-dinner nap and rises at the end of the period with a feeling of general discomfort, quickly followed by fierce stabbing sensations in a given locality. The pain is generally sharp and lancinating, but it may be dull, heavy, and boring. It is nearly always of sufficient severity to interfere with the patient's usual vocations and may become almost intolerable. The rest at night is often broken and the patient then grows pallid from loss of sleep. There is usually no fever or preceding rigor. Sometimes there is slight chilliness, and there may have been malaise and gradually growing indisposition for a number of days preceding the onset of the attack.

In some rare instances the outbreak is not accompanied by any feelings of distress. This is more apt to be the case in children than in adults.

The appetite for the most part remains good; but, owing to the insufferable nature of the pain, nausea and even anorexia may at times be incited. The functions of the different organs are, in general, conducted with their ordinary regularity.

The attack of pain may make its appearance days and even weeks before the eruption shows itself, but usually the vesicles follow in the course of a few hours. A reddened or bluish-red patch of the size of a half-dollar silver piece or

larger is first exhibited. This area rises to the height of two or three lines, is sharply defined, and is exceedingly tender to the touch. So painful is it that often the friction of the clothing can scarcely be borne. The discoloration deepens and there is a sensation of heat or burning in the patches. In a very short time the vesicles appear.

The vesicles in herpes zoster when fully formed are unlike those seen in any other disease of the skin. They rise from the surface of the œdematous patch freely and distinctly, often having the appearance of being stuck on instead of forming an integral part of the tissues. They are tense, clear, and glistening, are oval or circular in outline, are always in groups, and the roof-wall in each is so firm that they do not ordinarily rupture unless subjected to mechanical violence.

At the outset the vesicles are filled with clear, translucent serum. This, in the course of a few days, grows cloudy in color and later becomes purulent. Hæmorrhage sometimes discolors the contents of the lesions. The number of vesicles in each group varies from three or four to one or even two dozen. They are usually from a split pea to that of a coffee-bean in size, but occasionally when very numerous are not larger than a mustard-seed. When small the lesions are much more likely to break down. In most cases from three to a half dozen groups may be found, but this number may be less or it may be greatly increased. The clusters are generally found following the course of a certain cutaneous nerve; but, because of the overlapping of the filaments from different trunks, it is frequently difficult to determine the particular branch which is affected. The distribution is nearly always unilateral, but where the disease

is severe the limits of demarkation are not sharply drawn at the median line, and the disorder may trespass upon it to a marked extent. This is due to the extension of nerve-filaments from one side of the body to the other.

Attention called to the great infrequency with which herpes zoster affects two widely-separated regions. Case observed of a middle-aged man who presented the lesions of the disease on the left side of the thorax, on the inner aspect of the left arm, and on the left side of the forehead. Bradshaw (*Lancet*, Oct. 13, '94).

Notwithstanding the common opinion as to the strict delimitation of the vesicles of zoster over a determined nerve-territory, the writer finds in a large number of subjects vesicles disseminated over the entire tegumentary surface. These vesicles resemble those proper to zona, and, if their evolution is studied, it is found that they belong properly to the zoster, and are not pustules of self-inoculation. Jeanselme and Leredde (*Gaz. Hebd. de Méd. et de Chir.*, July 28, '98).

Fingers are by no means an uncommon situation for herpes zoster. It has been observed in women who have to wash dirty linen or bandages from suppurating wounds, and also among hospital nurses. It is due, in every instance, to a direct infection of the finger. A large flat blister first attracts the patient's attention. There is a slight amount of redness, but no oedema. It usually affects the metacarpal or middle phalanges. F. Guernonprez and A. Platel (*Jour. des Malad. Cut. et Syph.*, Dec., '99).

In so-called double zoster the girdle, or zone, about the body is complete. This form of the disease is exceedingly rare and is very apt to be productive of great distress. The belief, however, in the fatality once accorded it has not been shown to be founded in fact.

The pain is the chief symptom of annoyance complained of. At times there may be more or less of itching and burn-

ing sensations, but these are not apt to occasion marked distress. The pain usually persists throughout the course of the eruption and subsides as the vesicles disappear, but it may endure for an indefinite period after all trace of the skin trouble has vanished. Weeks, months, and even years, with complete shattering of the nervous system, have been recorded of such continuance. Age has a decided influence upon the character of the pain. In children it is ordinarily mild, while in the aged it is apt to be extreme in its severity.

Case of a child suffering from reflex epileptic convulsions, which supervened upon an eruption of herpes zoster occurring in the distribution of the superior superficial branches of the cervical plexus, the left side of the head, neck, shoulder, and upper part of the thorax being affected. With the disappearance of the eruption the convulsions ceased. Byron (*N. Y. Med. Jour.*, Jan. 10, '91).

The pain is more decided when the head is attacked than in the regions of the trunk or limbs. In rare instances complete anæsthesia of the part follows or anæsthesia dolorosa may supervene. Motor as well as sensory disturbances exhibited in local paralyses may occur.

Case of an old woman who, while suffering from a subacute attack of rheumatism, developed neuralgia of the right side of the neck and face with an eruption of herpes zoster. The eruption followed the course of the superficial cervical plexus and the facial nerve. After a few days a complete Bell palsy occurred. In the course of four months, under treatment, the palsy disappeared. H. A. Spencer (*Lancet*, June 9, '94).

Case of herpes zoster with facial paralysis and another with sensory disturbances. The writer agrees, with Recklinghausen, that there is a primary affection of vasomotor nerves, the vasodilators being irritated, and looks on the herpes as an intense angioneurotic disturbance which may be associated with

diseases of the motor or sensory, spinal or cerebral, nerves.

In most cases the disease results from causes acting on the body in general, though trauma and cold may assist. It is possible that infection or autointoxi-



Herpes zoster, with facial paralysis.
(Ebstein.)

cation plays a part. Ebstein (Virchow's Archiv, B. 139, H. 3, '95).

Typical case of herpes zoster, affecting the entire right side of the neck and face, corresponding with the lower region of the cervical plexus, observed in a man 75 years old. After ten days of acute suffering total paralysis of the right facial nerve suddenly set in. The pain and the paralysis gradually diminished, and finally disappeared after from two to three weeks' treatment by the galvanic current. Olaf Frich (Norsk Mag. f. Lægevidenskab., p. 1125, '96).

Combination of herpes zoster and facial paralysis very rare. Ebstein was able to collate but eleven cases. The author has found seven others, and adds the following of his own: a woman, aged 20 years, no nervous disease in family. Trouble began the day after sitting in a draught, with a drawing sensation in right side of face, slight tenderness over right eyebrow, followed by pain radiating from neck to back of head and on right side. On the third day a total right-sided facial paralysis.

Four days later a vesicular eruption on the lower half of the right ear and in the auditory canal, on the right half of the tongue, uvula, and palate. The paralysis was very marked, with complete reaction of degeneration. The tongue protruded straight; touch and taste unimpaired. Sensation of face intact. No tenderness at points of exit of the fifth and seventh nerves. No cerebral symptoms. So far as the author knows, this is the fourth case in which the paralysis preceded the herpes. The phenomena in this case may be explained as follows: The trigeminal branches were involved; the lingual herpes was caused by continuation of the inflammation from the facial to the chorda tympani and affected only its trophic fibres. Eichhorst (Centralb. f. innere Med., No. 18, '97).

Loss of hair and teeth and atrophy of the muscles have been noticed (Strü-



Herpes zoster, with facial paralysis.
(Ebstein.)

bing). The disease is usually benign and acute, running its course in from three to six weeks.

Zona may appear under three different conditions: First, toward the end of severe pulmonary tubercle, and it is then

of no special interest; but in other cases it is a very early symptom, and may be looked upon as a premonitory sign. Cases cited of patients subject to herpes zoster, but who did not complain of any pulmonary affection. On examination of the lungs, however, early tuberculosis was discovered. In other cases, forming the third group, the signs of pulmonary tubercle may be discovered after a short interval, there being no physical indication at the time of the eruption. Ronher (*Jour. de Méd.*, Apr. 10, '97).

Resolution takes place by absorption of the vesicular contents or a crust forms which desiccates and is then exfoliated.

Indelible scars are occasionally left at the sites of the vesicles. They have a punched-out appearance, as if a nail-head had been driven sharply into the skin and had left its impress upon it. These scars should never be mistaken for the relics of syphilis. The disease when attacking the region of the eye is apt to be unusually severe, and death has been known to follow. The eyesight is frequently endangered.

In virulent types of zoster hæmorrhage into the vesicles may take place, giving them a bluish or blackish appearance (zoster hæmorrhagicus). An abortive form of zoster, in which the pain appeared in typical manifestation, but without the development of vesicles, has been noticed.

Coalescence of the vesicles often takes place. Where the blebs are opened dirty, grayish ulcers are apt to form. These ulcers are decidedly rebellious to treatment and invariably leave scars. All of the groups do not usually appear at the same time, but come out one after the other at intervals during the first week or ten days. They enlarge somewhat, but seldom unite.

REGIONAL ZOSTER.—Herpes zoster may attack any part of the body, but it

apparently exhibits a preference for certain sites, and to its appearance in these localities certain names indicative of the region affected are given. Thus we have zoster capillitii, z. frontalis, etc. When the disease invades two adjoining regions more precise terms, such as zoster cervico-brachialis, z. intercosto-humeralis, and so on, are used. The general features of each are the same, but, owing to anatomical differences, some characteristics need special description.

Zoster is not infrequently found attacking the various regions of the head. In the scalp (z. capillitii) the lesions are apt to be the seat of severe burning sensations, the occipital region being most often the part affected. Over the forehead (z. frontalis) disfiguring scars are likely to result. The branch of the supra-orbital nerve that passes upward is here the one that is usually involved. The ear (z. auricularis) is sometimes attacked, and the cheeks, side of the nose, and chin are not unusual sites. The disease may appear in the mouth-cavity (z. buccalis), upon the inner wall of the cheek, and the gums. Zoster exhibits its greatest severity when the eye (z. ophthalmicus) is attacked. The first branch of the fifth nerve is then affected. The nasal filament of the same nerve is often implicated and the eruption extends downward upon the nose and cheek. The pain is severe. The conjunctiva is reddened and swelled, the cornea is inflamed, and iritis may follow, with marked disturbance of vision and œdema of the neighboring parts. In its severer forms disintegration of the eyeball with loss of sight occurs and a resulting meningitis may lead to a fatal issue. Sympathetic involvement of the other eye may take place.

While we must regard zoster of this region as a grave affection liable always

to destroy the eyesight and endanger life, yet instances are on record in which the attack, though serious, resulted most favorably.

Case of bilateral zoster ophthalmicus occurring in a patient suffering with chronic pneumonia and diffuse interstitial nephritis. The case was anomalous in that the attack came on without pain and exhibited a variety of lesions. The eruption consisted of pustules, vesicles, and bullæ occurring at the same time. By the end of the third day these lesions had broken down completely, forming freely-discharging ulcers. The greater part of the face-region was affected. The disease ran its course in three weeks and ended in complete recovery. Robertson (London Lancet, July 7, '88).

Zoster is more frequently encountered on the surface of the thorax (z. pectoralis) and the neighboring abdominal (z. abdominalis) parts than elsewhere on the body. The right side is more often affected than the left. In the thoracic region the intercostal nerves are attacked. The pain is marked and when occurring before the eruption appears is apt to be mistaken for pleurisy. The presence of fever is needed to establish the latter affection. In zoster of the thorax considerable interference with breathing is liable to be experienced, owing to the pain occasioned by movements of the chest-wall. Dühring notes that the pain here may simulate the distress occasioned in angina pectoris. Because of the peculiar distribution of the diseased areas in these parts in the form of a belt or girdle has arisen the common designations of zoster as *zona* or *cingulum*. It is not unusual for the disease to be preceded in this situation for some time before its eruption by its characteristic pain. The nerves affected in abdominal zoster come from the dorsal and lumbar portions of the cord.

Two cases of thoracic herpes zoster in which a diffuse radialis was observed. This is a painful sensation in the spinal region, both spontaneous and increased by pressure. It is localized along the chain of the spinal apophyses and a little on each side of these, and extended from the third dorsal to the second lumbar vertebra in the cases observed. In some cases zoster is a dermato-neurosis indicative of disturbances of nutrition of the nerve-elements in course of the evolution of an infectious malady. Terré (Edinburgh Med. Jour., Sept., '90).

Herpes zoster brachialis involves the shoulder and upper arm to the elbow. It may extend down the forearm, and even as far as the finger-tips, attacking the palmar surface of the hand; but this is rare. The flexor surface of the arm is more often selected than is the extensor.

In zoster femoralis the disease spreads over the buttock, thigh, and down the leg. It usually does not go below the knee and the feet are as seldom attacked as are the hands.

Case of universal zoster. The subject was a man, 30 years of age, who had suffered from two severe attacks of malaria. The first occurred at the age of twenty-seven and lasted for a number of months. At thirty he was affected a second time with the disease. This was accompanied by severe neuralgic pain and burning sensations. Within a few days from the beginning of the fever the zoster appeared and was universal in its distribution. Even the conjunctiva and the mouth, nose, and anal cavities were invaded. Colombini (Commentaris Clinico delle Mal. Cut. e Genito-Urin., '93).

ZOSTER ATYPICUS GANGRÆNOSUS ET HYSTERICUS.—Kaposi noted a peculiar form of recurring herpes in a number of cases reported by him to which he gave this name. Three of the subjects were women and one was a man. In all distinct symptoms of hysteria were present. In each case the eruption consisted of vesicles and papules gathered in groups.

A central crust formed in each vesicle and about it there developed a number of tiny pustules. A number of the lesions coalesced, and gangrene of the part followed. After separation of the slough and healing by granulation had taken place, keloid formed in many of the cicatrices. The period of development lasted for about eight days, when subsidence began to take place. Both sides of the body were affected and in all but one case a number of recurrences took place.

Diagnosis.—The recognition of herpes zoster does not usually present any great difficulty. The severity and peculiar character of the pain, the grouping of the large, firm vesicles upon an erythematous base, the lesions running their course without rupturing, and the common limitation of the trouble to one side of the body and in the line of some cutaneous nerve are the distinctive features that differentiate the disease.

At times HERPES SIMPLEX assumes some of the severer features of zoster, or the zoster may be so mild that its manifestations partake of the benign nature of the simple disease, in either of which cases some difficulty may be experienced in determining the true nature of the disorder. This, however, is but a matter of little moment so far as treatment or prognosis is concerned. It but emphasizes the close relationship of the two affections.

ERYSIPELAS begins with a marked rise in temperature, the area affected increases gradually by peripheral extension, there is seldom any formation of vesicles, and the peculiar bluish hue of the disease is never seen in zoster.

With ECZEMA zoster need never be confounded. The vesicles are wholly unlike. Those of eczema are small, thickly and irregularly scattered over the surface,

and they rupture readily, while a continuous flow of serum follows their dissolution.

Etiology.—The surface-lesions in herpes zoster are produced by an inflammation of the nerves supplying the parts. This neuritis may occur at any point in the track of the nerve, in the ganglion through which the nerve passes, or in the central nervous system. The skin-manifestations, while of the greatest interest, are entirely secondary to the nerve-disturbances. They are the superficial indications of serious trouble deep within the body.

Herpes zoster is associated with definite lesions of certain sensory ganglia, sensory nerves, and the skin capable of being excited by a variety of causes, probably the soluble toxins of various microorganisms. The skin lesions may be on the head, neck, trunk, or extremities, corresponding to the Gasserian and posterior root-ganglia affected. Various forms can be distinguished—(a) spontaneous or primary herpes, possibly a specific infectious disease, the specific causal agent of which has a special affinity for certain sensory ganglia (posterior, spinal, and Gasserian); (b) herpes occurring after certain definite toxic agents, *e.g.*, arsenic, carbonic oxide gas, etc.; (c) herpes occurring in the course of certain acute infectious diseases, as pneumonia, cerebrospinal meningitis, and probably of malarial and typhoid fevers. The lesions of the ganglia and of the skin in *a*, *b*, and *c* are the same, and the processes are probably identical; (d) herpes simplex affecting the lips and nose in coryza, gastrointestinal intoxications, etc., and genitals, has not been sufficiently investigated to be classified; no evidence exists for or against its connection with changes in the nervous system. The changes in the skin are illustrative of particular forms of necrosis and inflammation. Herpes should be classified according to its relation to changes in the nervous system. Howard (*Amer. Jour. Med. Sci.*, Feb., 1903).

Several cases in which an eruption of herpes zoster has followed some cause producing mental emotion or anger. Roche (*Lancet*, Oct. 13, '94).

The list of causes known to be operable in the production of the disease is a long one. These different agents vary greatly in their nature, but their action is alike in that the irritation of each, operating upon the nerve, is sufficient to induce a true inflammation of its substance.

Climatic influences are most prominent.

Epidemic herpes zoster considered an infectious neuropathy, prevailing epidemically under the influence of climatic conditions not as yet understood. Weiss (*Archiv f. Derm. u. Syph.*, H. 4, 5, '90).

In an examination of the blood of 8 patients affected with zoster 4 of them were found to have a malarial infection. Exclusive of the 8 cases previously reported, the total number of cases examined was 25. Of these, 14, or about 56 per cent., gave positive evidence of paludism, the malarial parasite being found in the blood. The results of these further studies show that nearly 40 per cent. of all the cases of zoster occurring in the writer's practice were associated with malaria. The writer does not assert that paludal infection is the only cause of zoster, but believes that it is one of the important agents. It is probable that other infections may have the same effect. J. M. Winfield (*New York Med. Jour.*, Aug. 2, 1902).

Sudden changes of temperature, exposure of the body when warm to a draft of cold air, a cold plunge into the water, lying out on the damp grass at night; getting overheated in close, hot cars, theatres, ball-rooms, or elsewhere, and then going suddenly into the cold, outer air; in short, any change whereby the surface-temperature of the body is rapidly lowered is capable of producing the disease.

Next in order are injuries of the body.

These may be slight or severe. Blows upon the head or over the spine, surgical operation, the prick of a thorn (Janin), the opening of an abscess, gunshot wounds, or the pulling of a tooth have been followed by the disorder.

Poisoning with sewer-gas will produce the disease. The use of the faradic or galvanic current may induce it. The internal administration of arsenic (Neilsen) is a well-known factor in its production. It has followed the ingestion of a large dose of Cayenne pepper (H. W. Blanc). Mental exhaustion, overwork, worry and sudden exertion may give rise to the malady.

Case of a woman, aged 50 years, who, after taking arsenic orally and subcutaneously for a malignant lymphoma, developed a gangrenous ophthalmic zoster, a diffuse and generalized vesicular eruption, and palmar and plantar hyperkeratosis. Bettmann (*Archiv f. Derm. u. Syphilis*, B. 51, H. 2, 1900).

Undoubted instances of infection have occurred. One of the most remarkable was recorded by Walther and quoted by Duhring.

[This case, given in "Text-book of Cutaneous Medicine," vol. ii, p. 485, deserves further mention. A student was attacked by herpes zoster. He was removed from his room, which shortly afterward was occupied by another person. This person in a few days' time was taken with the same disorder. He, too, was transferred and the room leased to a third occupant, like the first, a student, who straightway developed a case of zoster. Numerous epidemics have been observed, the most notable among which are those recorded by Kaposi in Vienna in 1888, and by Weiss at Prague. The latter observer noted fifteen cases in less than two months. The nature of the epidemic, coupled with the season at which it occurred, led Weiss to regard the infectious agent as one peculiarly dependent upon climatic influences: a supposition that coincides with our

general knowledge of the disorder.
[WILLIAM FRANCIS ROBINSON.]

The disease may occur at any age and in either sex. It is most frequent in early spring or late autumn: seasons when marked changes in temperature are liable to take place.

In a series of 235 cases of herpes zoster 45 per cent. were males; most cases occurred between the ages of 10 and 15. The greater proportion of cases occurred in the spring months. In most cases the sensitive fibres of the nerves alone were affected, but 2 cases of marked facial paralysis came under notice accompanying herpes zoster of the face or head. Herpes zoster cannot be shortened in duration or the eruption aborted. Irritation should be avoided and the vesicles should not be broken. Greenough (N. Y. Med. Jour., Oct. 19, '89).

A comparison of the results reached by J. Abbott Cantrell after a study of 193 cases and other dermatologists with his own, as studied in the Berlin Dispensary for Skin and Venereal Diseases, led to the following conclusions:—

In frequency, herpes zoster causes 1 per cent. of all skin diseases. There appears to be no difference in the occurrence of herpes zoster in men and women. Herpes zoster is a disease of youth (fifteen to thirty years), noted, according to his statistics, in two-thirds of the cases. Before school-age the disease is very rare, during school it becomes more frequent, after thirty years its frequency diminishes, and in old age it is rare. So far as regards the region of the body affected, herpes zoster is, in general, more frequent, the more nerves supply the region. There is one exception to this rule, both from his own observations and those of Greenough, namely: an exceptionally large number of cases in the trigeminal region. This may, perhaps, be due to the fact that the region supplied by the trigeminus is more open to injury and disease than any other region. Both sides of the body are apparently affected with equal frequency, bilateral herpes zoster being rare. Zimmerleni says that herpes zos-

ter occurs among physicians and nurses in epidemic form; no other occupation seems to predispose to the condition. The final settlement of this point can only be made by consulting industrial and hygienic statistics. Epidemics of herpes zoster occur in the spring and fall. Sporadic cases occur with almost equal regularity throughout the entire year, though some increase is noted in the spring and autumn months. Joseph (Phila. Med. Jour., Oct. 25, 1902).

Pathology. — Baresprung demonstrated that the disease was primarily one of the ganglionic system, and this has been confirmed by numerous other investigators. Wyss examined a case dead of zoster facialis, and found the ganglion of Gasser enlarged, soft, and deeply injected. The nerve between the brain and ganglion was surrounded by extravasated blood. It was healthy at its origin. The peripheral filaments were infiltrated with soft tissue.

In a case in which the first branch of the trigeminus and the naso-ciliary branch were the nerves attacked found, at the necropsy, the interstitial tissue of the Gasserian ganglion infiltrated with inflammatory products and the ganglion-cells destroyed. The ciliary nerves were likewise found affected. Daniellsen found the intercostal nerve reddened and thickened and the neurilemma markedly infiltrated in a case of zoster of the trunk.

Later studies have confirmed the statements of these older observers, but they have also added much to our knowledge. We now know that the ganglion is not alone the part that is first attacked, but that the inflammation may arise at any point in the continuity of the nerve-trunk in its peripheral termination, in the spinal cord, or within the brain. When the brain or spinal cord is the seat of the trouble, bilateral zoster is apt to follow. This is rare. In the case of

zoster following blows and injuries to the skin only the terminations of the nerves appear to be affected.

The skin-lesions of zoster have received much attention. Biesiadecki and Haight were the first who made a careful study of the vesicle. They found that it began in the deeper layers of the rete and that the exudation forcing its way upward separated the rete-cells, forming elongated bands or threads. After reaching the horny layer the fluid—no longer able to make its way between the cells—lifted the epidermal layer bodily, thus forming the roof-wall.

Robinson's investigations led him to the discovery of a perineuritis of the cutaneous nerves exhibiting a small-celled infiltration of the neurilemma.

Unna found that the vesicles in herpes zoster had a structure distinctively their own, due to a peculiar form of epithelial degeneration to which he applied the term "ballooning." In the process of colliquation that here takes place the cells increase greatly in size, becoming, in many instances, hollow spheres, and in others with one side drawn out, suggestive of a balloon. Other unique and various forms are assumed. The protoplasmic contents are converted into a fibrinous opaque mass, the nucleus is divided into a number of daughter-bodies that do not wholly lose their nuclear character, and the prickles are lost, thus severing the union of the cells the one with the other. In this disorganized condition the cells separate and accumulate in the hollow of the vesicle.

Peculiar form of vesicle in herpes zoster, which affected the mucous layer of the hair-follicle exclusively, and differed histologically from the usual vesicle as it occurs in this disease. It was a secondary effect of the real herpes zoster vesicle, which was located in the root-sheath of the hair-follicle, whence a sero-

fibrinous exudation traveling up between the inner and outer root-sheaths of the follicle raised up the corneous layer at the follicular orifice, producing there the visible vesicle. It is in reality herpes zoster of the hair-follicles, and has not been described before. S. Pollitzer (*Jour. of Cutaneous Med.*, Feb., 1903).

From the roof-wall of the lesion are seen hanging a number of compressed, cord-like, epithelial cells, forming a species of partition, thus dividing the cavity apparently into a series of compartments. But because of the indifferent connection possible in cells undergoing this form of degeneration there is no real division of the vesicle. The vesicle-contents, in addition to the degenerated epithelium and giant cells, consists of coagulated fibrin. Into the base of the vesicle can usually be seen projecting the denuded summits of the papillæ. The vesicle is situated well within the epithelial tissues.

When the acme of vesicle-formation is reached marked emigration of leucocytes from the neighboring vessels into the papillary body and the vesicle takes place. It seems, however, never sufficient to fill the cavity of the blister, crusting and desiccation taking place before this condition is reached.

In zona there are no marked changes in the number of red corpuscles or in the percentage of hæmoglobin; nor do the red blood-corpuscles present any recognizable alteration. The white corpuscles are above the normal on the first day of the eruption. This hyperleucocytosis increases until about the third day, then it decreases gradually up to the fifth day. If the contents of the vesicles become purulent, the number of leucocytes diminishes. The period of desiccation and desquamation is marked by a second hyperleucocytosis. At the end of about two weeks the blood resumes its normal character. In the clear vesicles on the first day of the eruption the fluid was found to contain

70 per cent. of polymorphonuclear neutrophiles, 19 per cent. lymphocytes, 1 per cent. of large mononuclears, while the eosinophiles are very few in number or completely wanting. During the following days the percentage of polymorphonuclear neutrophiles increases to 96 per cent. On the sixth day the contents of the vesicles presented disintegrating polymorphonuclear neutrophilic cells associated with eosinophiles undergoing disintegration. Sabrazès and Mathias (*Revue de Méd.*, Mar. 10, 1901).

What appears peculiarly striking is the relatively unimportant changes that take place in the epidermis around and beneath the vesicles. The blood-vessels and lymph-spaces are dilated for but a few lines only. The sweat-glands are not affected. The hair-follicles share in the process inasmuch as the prickle-cell layer dips downward toward their base. The cutis is affected in a slight degree only and that mainly in the infiltration of a few leucocytes.

Pfeiffer was the first to call attention to some peculiar bodies in the vesicles of herpes zoster.

[Pfeiffer (*Monat. f. Prakt. Derm.*, p. 589, '87) regarded these bodies as organisms belonging to the protozoa and the probable cause of the disease. Hartzell (*Jour. Cut. and Genito-Urin. Dis.*, Sept., '94) examined these same structures carefully and came to the conclusion that they were not protozoa, but the products of cell-degeneration, and had nothing to do with the origin of the disorder. T. C. Gilchrist (*Johns Hopkins Hosp. Reports*, vol. i, '96) made an exhaustive study of the subject, examining, in all, twenty cases. He found the bodies in sections of tissue taken from the skin in the erythematous stage of the disease as well as in the vesicles. In no case could he discover amœboid movement. He describes them as bodies having a well-defined outline with granular contents. They were found singly and in groups. In the vesicles they were gathered at the sides and bottom. Some

large groups were found where no vesicle-formation could be detected. The author thinks that the bodies are the nuclei of epithelial cells or eleidin granules similar to those found in the mucous layer. WILLIAM FRANCIS ROBINSON.]

Prognosis.—Herpes zoster runs its course usually in from three to six weeks. Abortive types may end in ten days or less, while the severer forms may be much prolonged. The disease is rarely fatal, save when the ophthalmic region is attacked. A lethal issue is then possible, and the eye may be sacrificed even if life be spared. Scarring is a not infrequent sequel of zoster if the vesicles be broken. The cicatrices are gathered in clusters typical of the grouping of the disease, and each has an angular outline with precipitous edges that gives to it a distinct and unmistakable individuality. Long continuance of the neuralgia may vex and weaken the nervous system until the subject becomes a complete physical and mental wreck. Such cases are, however, exceptional. Double or bilateral zoster is rare. We can explain its occurrence upon the assumption of a neuritis within the central nervous system, or, at least, beginning there. Its increased severity is, no doubt, due to the greater involvement of nerve-trunks, but the gravity that once was supposed to attach to the trouble has been disproved.

Herpes zoster recurs so seldom that one attack is believed to render the patient immune.

Treatment.—Herpes zoster is a self-limited disease, rarely endangering life and seldom recurring. Its treatment is, therefore, simple. The most urgent indication with which we have to contend is relief of the pain. This is sometimes nearly unbearable. The character of the distress is likened often by the patient

to that of a red-hot iron drilling into the flesh. Sleep then is impossible, and the restlessness is extreme.

The subject affected should be put to bed and absolute quiet enjoined. Freedom from worry and care, coupled with complete physical relaxation, is essential to the best results to be obtained from treatment. The bowels should be moved freely. For this purpose a mild dose of calomel given at bed-time, followed by a brisk saline cathartic in the morning, answers well. To keep the bowels open a glass of warm Hunyadi water, or a Seidlitz powder may be given each day before breakfast.

The diet should be light and easily digestible. Milk freely if the patient can tolerate it, broths, soups, soft-boiled eggs, oysters in season, fish, and chicken should constitute the list from which the articles of food for the patient's need may be selected. These patients often have very good appetites, and care should be exercised in not allowing overindulgence, such a course usually being followed by marked aggravation of the pain.

Internal medication has not as yet shown itself capable of shortening the course of the disease. But there are a number of drugs that markedly affect the pain and make the patient's condition bearable. Chief among these is zinc phosphide. This may be given in doses of $\frac{1}{8}$ to $\frac{1}{3}$ grain in tablet form every two or three hours until the pain is under control, when the dose may be reduced. It is sometimes more effectual when combined with the extract of nuxvomica, $\frac{1}{8}$ to $\frac{1}{4}$ grain of the latter drug being used. Sodium salicylate and salicin in 10-grain doses every four hours, especially if there be any rheumatic taint, are often productive of much good. Antipyrine, phenacetin, and other drugs

of the series relieve the pain, and it is thought have even shortened the course of the disease (Jennings). Arsenic is often used, but we should not forget that it is capable of producing the affection, and therefore likely to aggravate, instead of benefiting, the disorder. When employed it should be used in full doses, $\frac{1}{20}$ grain of arsenous acid in tablet form, or combined in a capsule with a small amount of iron, being given four times a day. Or 3 to 5 minims of Fowler's solution in water after taking food may be used. Quinine in full doses is serviceable when malarial poisoning is the basis of the trouble. Camphor in small doses often repeated has been found to give the patient comfort.

If there be much nervousness, the bromides of sodium and potassium may be needed, but it is best to do without these drugs if possible. Tincture of aconite in drop-doses at intervals of two hours has proved serviceable. Sodium hyposulphite in 5-grain doses every three hours does good.

It will be seen that the list of drugs employed is a long one, which being rightly interpreted means that no one of them is infallible, but that all will fail at times to produce the results expected. If we cannot control the pain by drugs given by the mouth we may resort to hypodermic injections. Ten minims of chloroform will usually be sufficient to check the pain. Cocaine may also be used, but it is best to avoid this drug, owing to the danger of inaugurating the habit. Morphine sulphate given subcutaneous in from $\frac{1}{4}$ to $\frac{1}{2}$ -grain doses will always control the pain. It is well to combine this drug with the sulphate of atropine, using $\frac{1}{100}$ to $\frac{1}{60}$ grain of the latter.

External treatment should not be neglected. The vesicles should be pre-

served intact if possible. Opening them will not shorten the course of the disease or mitigate the distress in any particular, and it nearly always results in the production of an obstinate ulcer that leaves an ugly scar. No picking or rubbing of the lesions should be permitted, and all sources of irritation—such as harsh woolen underclothing—should be removed. Dressings that protect the lesions from the air should be employed. One of the best applications that can be used is alcohol.

[This was well demonstrated by De-loir (Brit. Jour. of Derm., vol. iii, p. 269), and Duhring has called especial attention to it in his recent edition of "Cutaneous Medicine." WILLIAM FRANCIS ROBINSON.]

Rupture of vesicles may be prevented in herpes zoster costalis by means of the following lotion:—

R Ichthyol, 2 fluidrachms.
Magnesium carbonate, 2 drachms.
Zinc oxide, 2 drachms.
Water, to make 4 fluidounces.

This should be sopped on and a binder applied to prevent rupture from friction. A 5-per-cent. ichthyol-collodion may also be used with advantage. T. G. Lusk (Post-graduate, xv, p. 1007, 1900).

It should be used in full strength, 94 per cent., and at frequent intervals. Compresses of cotton or soft-linen stuff should be saturated with the alcohol and bound over the parts. To prevent evaporation, these should be covered with some impermeable material, such as oil-silk or gutta-percha. This gives prompt relief to the burning and local distress, and affords the patient much comfort.

Ointments and pastes can often be used to advantage. Lassar's paste (see HERPES SIMPLEX) is useful. When properly made it furnishes a good protective dressing. It should be thickly applied and then thoroughly dusted over with a simple powder, such as talc or corn-starch. Anodyne remedies—

such as opium, belladonna, or cocaine—may be added to it if needed. It is capable of relieving the cutaneous symptoms, and under it the lesions dry up and heal without rupturing. Simple ointments may relieve the itching and burning, but their softening influence upon the epidermis renders the rupture of the vesicle more probable.

Cocaine causes the eruption completely to disappear in a few days. In twenty-three cases an ointment used contained equal parts of vaselin and lanolin, and 1 per cent. of hydrochloride of cocaine. This is smeared on the part, which is then covered with a piece of linen on which has been spread the same ointment. Beuler (Semaine Méd., Nov., '99).

Lime-water, black-wash, carron-oil, and lead-water washes may be found useful. They should be applied freely, the surface being kept constantly moist with gauze saturated with the agent chosen. Lotions of carbolic acid and camphor, $\frac{1}{4}$ to $\frac{1}{2}$ drachm of each to the ounce of alcohol, are valuable. The following substances in alcoholic or aqueous solution are often found useful: Tannin, 30 to 60 grains to the ounce; menthol, 5 to 15 grains to the ounce; benzoin tincture, 30 minims to the ounce; resorcin, 5 to 15 grains to the ounce. These should be applied freely to the affected parts and allowed to dry, after which a dusting-powder may be used with advantage. Such may be made of zinc oxide, starch, boric acid, lycopodium, or talc. Anderson's dusting-powder—which is compounded of camphor, zinc oxide, and starch—is especially useful.

Liquid thiol diluted with an equal part of water, or with twice the amount of ether, applied in herpes zoster with beneficial result. Stepp (Münch. med. Woch., Jan. 6, '91).

In herpes zoster local sedatives to the vesicles recommended when the case is typical. Thick bandage is applied over a dusting-powder composed of amylum,

or amylum and opium, to reduce pain and keep the part dry; a layer of wadding is placed over these.

In zoster hæmorrhagica, or where the vesicles are closely set, the affected parts must be carefully protected lest they be torn. With this object in view the following ointments were prescribed:—

R Boric acid, 75 grains.

Glycerin, q. s. to make a solution.

R Simple ointment, 5 ounces.

Cocaine or extract of opium, 22 grains.

In cases in which neuralgia is a complication Fowler's solution is invaluable. Kaposi (Med. Press and Circular, Jan. 16, '95).

In herpes zoster treatment should always be begun by the administration of a saline purge, preferably sulphate of soda. In dealing with the eruption the effected part must be kept absolutely dry; the painful region should be covered with a layer of cotton-wool, sprinkled with the following powder:—

R Starch-powder, 2 ounces.

Oxide of zinc, 4 to 5 drachms.

Powdered camphor, 15 to 45 grains.

Crude opium powdered, 15 grains.

For the neuralgia the following pills are given:—

R Extract of stramonium,

Extract of hyoscyamus, of each,
 $\frac{2}{100}$ grain.

Extract of belladonna, $\frac{2}{100}$ grain.

To make one pill.

Four of these to be taken daily.

If these pills do not relieve the pain, antipyrine must be given internally. A. Robin (Bull. de Thé., Oct. 30, '95).

A collodion composed of the following ingredients is markedly sedative:—

R Picric acid, 75 grains.

Cannabin, 25 grains.

Alcohol, 2 drachms.

Ether, 3 drachms.

Elastic collodion, 4 drachms.

It relieves the violent pains, and the intense itching which sometimes accompanies zoster. It protects the part and prevents the possibility of secondary infection. The crusts which are formed by this application are a valuable protection

to the new epidermis. Brocard (La Presse Méd., Dec. 16, '99).

Brilliant results obtained from the application of an aqueous solution of picric acid, 12 parts to 1000, applied freely to the affected area by gauze compresses or absorbent cotton. The compresses wet with the solution are retained in position by a roller bandage. Delebecque (La Presse Méd., Dec. 16, '99).

The following local treatment for herpes zoster is recommended: Several layers of absorbent gauze soaked in absolute alcohol are applied to the affected part and covered with some impermeable stuff, over which is placed cotton-wool. The dressing is renewed in twenty-four hours. Six cases are reported, including one gangrenous and one hæmorrhagic. This relieves the pain in a short time and also promotes healing. Winternitz (La Semaine Méd., April 3, 1901).

Where tenderness can be detected over the exit or in the course of a spinal nerve the wet cup may be tried. Not more than 1 ounce of blood should be abstracted. Or a blister may be applied. For this purpose cantharidal collodion answers an admirable purpose, and frequently gives marked relief.

Paquelin cautery at a red heat used in the treatment of the neuralgia of zoster, cauterizing the skin over the origin of the nerves superficially, but not enough to produce scarring. Elliot (Jour. of Cut. and Genito-Urin. Dis., Sept., '88).

In nearly all cases of herpes zoster a tender spot may be found higher up over the nerve-trunk. At this point the application of a counter-irritant in the form usually of flying-blisters or turpentine recommended. Theodore Wilkins (Med. Record, Sept. 26, '96).

Duhring speaks very highly of the use of the constant current in the treatment of zoster. Its use wherever possible is to be commended. From five to ten cells of the ordinary zinc carbon battery should be used. The negative pole should be placed over the seat of the eruption and the positive grasped in the

patient's hand; or, better still, be passed up and down the spinal column. The belief exists that if used early enough it will abort or greatly shorten the course of the disease. Certain it is that it will greatly subdue and soften the pains of the disorder. It is of the greatest value in the lingering pains that remain after the zoster has subsided. In such cases the current should be used two or three times daily, fifteen minutes being given to each application.

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HIP-JOINT DISEASE.

Definition.—What is usually known as “hip-joint disease” is a tuberculosis of the hip-joint; but tuberculosis, by no means, includes all the diseases which may affect the hip. The hip may be affected by tuberculosis, by syphilis, by rheumatism, and by a variety of acute infectious processes subsequent to the occurrence of some acute infectious disease in other parts of the body, or may be the seat of a simple synovitis caused solely by trauma. A synovitis of the hip is usually associated with osteitis, but a synovitis may exist independent of osteitis and subside without the occurrence of any involvement of the bones.

The hip-joint is also the seat of arthritic deformans and Charcot's disease, though the latter is rare; and occasionally loose bodies are found in it. Malignant tumors also may affect the hip.

Functional affections of the joint are usually traumatic neuroses, but may be considered here.

Symptoms.—The symptoms of *inflammation* in the hip vary somewhat, according to the character of the inflammation present. If the hip is the seat of an acute synovitis, pain will be felt in the hip itself, which will be intensified by

movement of the joint or by pressure over the neck of the femur at a point between the great trochanter and the crest of the ilium. The position of the limb is very characteristic. The thigh is flexed upon the abdomen, abducted, the toes everted, and the entire limb rotated outward. This position allows the capsule to contain the largest amount of fluid, and, in consequence, is the position of ease which the joint naturally assumes when overdisted. In cases of this sort, also, there is usually a distinct history of a traumatism immediately preceding the occurrence of pain. These cases are also extremely sensitive to any sort of motion. In standing the patient bears all the weight of the body upon the sound side, and in consequence of the position of the affected thigh, the gluteo-femoral crease on this side is much less distinctly marked than on the well buttock. In cases where the joint is the seat of an acute infection, following measles, scarlet-fever, or the like, the same train of symptoms will be present, though the progress of the disease will be much more rapid, while, combined with the local symptoms, will be found those of general systemic infection, and under these circumstances disintegration of the joint may progress with remarkable activity.

In *syphilis* of the hip, on the contrary, the disease may have been present for months without the occurrence of pain sufficient to attract the parents' attention. It is only when a marked limp becomes noticeable that medical advice is sought, and in some of these cases when marked deformity is present and joint-spasm is very pronounced, manipulation seems to give rise to but trifling inconvenience, and the parents at times are loath to believe that serious trouble exists, because the child complains so very little.

In tuberculosis of the hip the pain at the outset is not apt to be marked; but, should an abscess form in the femur or the disease progress until the cartilage becomes involved, the pain becomes most exquisite, children often crying severely from the jar occasioned by a person walking on the floor, and so shaking the bed.

In some of these cases there is a distinct history of traumatism, and in others it seems impossible to find precisely when the disease began. Many of the cases which come to the surgeon with the history that the first symptoms were noted by the parents a few days previous, being evidently of very long standing. The inattention of the parents to the trifling limp which the child exhibits, and the fact that it did not at first complain of pain sufficiently to attract their attention, being responsible for this. Quite frequently these children complain of being stiff on rising in the morning, and exhibit a decided limp, but after having been at play for some hours they run in almost a natural manner, and so little is thought of it. In some cases this limp gets better and may almost disappear for a number of weeks, occasionally a couple of months, then reappear in a still more aggravated form, to subside once more, and again reappear. It is unusual, however, for cases to pursue this course, and the majority grow progressively worse, and do not, unless treated, exhibit these periods of freedom from symptoms.

The symptoms to observe in early diagnosis are: (1) stiffness of the joint due to tonic muscular contraction; (2) attitude of the limb in standing, walking, or lying, and either flexion, adduction, or abduction; (3) lameness; (4) atrophy; (5) pain; (6) swelling. These are in the order of their importance. In differentiating this disease in the early stage quite a number of affections at times present themselves, especially

rheumatism, contusion, sprain, and neurosis of the hip-joint. Infantile paralysis, acute synovitis, bursitis, and periostitis are a few others to be taken into consideration. A. R. Shands (Amer. Jour. of Obstet., Aug., 1902).

The obturator nerve sends a little filament to the inner side of the knee-joint



Fibrous ankylosis of the left hip-joint following typhoid fever, relieved by *brisement forcé*.

as well as to the hip-joint, and to this fact is due the characteristic pain in the knee which usually accompanies disease in the hip-joint, and which, in the great majority of cases, antedates the occur-

rence of pain in the joint itself. The obturator nerve often joins the long saphenous, which accounts for the fact that pain in the big toe is very frequently noted before pain in the knee, which, however, seems to have escaped the attention of a good many writers on this subject. Quite frequently children will be brought for observation because they limp and because they have complained of pain in the big toe, which the mother had supposed was due to some defect of the shoe or stocking or an ingrowing nail. Examination in these cases will frequently reveal the presence of hip-joint disease.

One of the first things which is present in inflammation of any joint is spasm of the muscles controlling the motions of that joint. In hip disease efforts have been made to draw inferences, on account of the preponderance of spasm in a particular group of muscles, as to the location of the disease in the joint, but so far without having put us in a position to diagnosticate with exactness the location of the focus of inflammation from the presence of spasm in certain groups of muscles. Not infrequently there may be noted, in addition to the spasm of the muscles immediately controlling the joint, spasm of the calf-muscles, although attention has very seldom been drawn to this fact. It often will be seen quite pronounced in the early stages of the disease, when deformity is very slight and limitation of movement in the hip-joint but slightly marked. It will usually be found in those cases where pain in the great toe has been noted instead of pain in the knee.

Hand in hand with muscular spasm comes atrophy of the muscles affected by the spasm, and this atrophy shows itself too promptly to be attributed wholly to disuse, and seems to be dependent on

impaired nutrition. It is one of the earliest and most important signs in connection with joint spasm in the diagnosis of incipient and doubtful cases, being of vastly more importance than the occurrence of pain; but usually it is not present until the disease has been in existence for some time.

The position assumed by patients with disease in the hip-joint varies according to the progress which the disease has made. At the outset the almost invariable rule is that the patient bears the weight of the body upon the sound leg, the toes of the affected side being turned slightly outward, the thigh being flexed, the leg everted and slightly abducted; the buttock on this side is decidedly flattened, and the gluteo-femoral crease lower down and more or less obliterated. On account of the abduction of the leg it seems longer than its fellow, but if accurate measurements be taken, with the limbs in the same relative position to the median line, this will be found to be an apparent, and not an actual, lengthening. As the disease advances this distortion becomes more and more marked, until the thigh may be flexed almost to the point of striking the chest, and the leg everted and abducted to the limit of possible motion. If the capsule has been greatly distended with fluid, it may spontaneously rupture, or some sudden movement may rupture it, and the leg may pass in a very short time from the position of extreme abduction and external rotation, to one of adduction and internal rotation. Quite frequently this change accompanying the rupture of the capsule is followed by marked relief from the pain of which the patient had previously complained. This position of adduction was formerly spoken of as the "third stage" of hip-joint disease, that of marked flexion and eversion being called

the "second stage," while the former position of slight flexion was denominated the "first stage" of the disease. And for purposes of explanation, it possibly may be well to retain these terms in some cases, though they do not represent invariably the different stages in the progress of the disease, as we sometimes find cases with marked adduction in the commencement of the disease, though in such cases we usually find the leg is rotated outward instead of being rotated inward, as it is when the thigh passes from the position of extreme eversion and abduction to that of adduction.

Coincident with the change of position from abduction to adduction, there comes a change from apparent lengthening to apparent shortening of the limb. If the disease has been in existence some time, there may be actual diminution in the length of the leg from absorption of bone, as well as the apparent shortening due to the adducted position in which the limb is held.

Diagnosis.—The diagnosis in hip-joint disease should only be difficult in the early stages. If a child is brought, complaining of a limp, an obscure pain in the toe, calf, or knee, do not be satisfied with finding something in the toe, calf, or knee which may account for its limp and pain, because it may possibly have disease of the hip in addition to its other ailments; but strip it, and watch its position with great care, allowing it sufficient time to become composed and assume its natural attitude, as quite frequently, under the influence of excitement, slight disturbances of function may easily be masked. After noting any of the abnormalities of attitude which have been just described, place the child upon its back upon a hard surface,—a table covered with a shawl, for instance. It is important that the surface be not so

thickly covered as to leave a yielding surface for the back to rest upon, as slight alterations in the position of the pelvis may then pass unobserved. With the normal child lying on its back, with its pelvis in such a position that a line drawn from the centre of the sternum



Appearance at the outset. (*Sayre.*)

over the umbilicus through the symphysis pubis is at right angles to a line joining the two anterior superior spines of the ilia, the entire back should rest upon the table while the lower extremities are in a straight line with the trunk, and also rest upon the table. If there is any arching of the lumbar spine, raise both

legs until the entire spine rests upon the table, and then lower the side which you believe to be the sound one until the back of the leg rests upon the table. If the joint of that side be unaffected, there will be no change in the position of the trunk and pelvis, and the spine will remain in contact with the table. Now lower the other leg gently to the table, and if there is involvement of the hip, the psoas and iliacus or rectus femoris

them from consideration, while careful examination of the spine should clear up the diagnosis between disease of the hip and disease of the spine, though in some cases both exist simultaneously, and the mistake of recognizing only one is sometimes made even by men of experience.

Case of hysteria in which there was an absolute increase of measurement from the anterior superior spine to the internal malleolus. After a prolonged and careful study the diagnosis of hys-



Right hip-joint disease, showing position in which leg must be placed to make back lie flat on table.

muscles will be sufficiently contracted to tilt the pelvis before the leg comes in contact with the table, and a slight arching of the lumbar spine will result. This tilting of the pelvis does not necessarily mean the presence of hip-joint disease. It means a contraction of the ilio-psoas muscle, which may be caused by inflammation of the spine, by appendicitis, or by salpingitis; but the previous history of the last two affections would exclude

terical hip disease was made. Marked thickening in the region of the affected trochanter was noticed after the patient had been under observation for fifteen months. This swelling was believed to be due to hysterical œdema. Upon pressure tenderness was present. The patient improved greatly under treatment, but did not recover entirely. J. J. Putnam (*Jour. Amer. Med. Assoc.*, May 4, 1901).

Both legs lying flat upon the table should then be moved to and fro, to

ascertain, if possible, the presence or absence of muscular spasm.

It is frequently advised that an anæsthetic be administered, in order that the condition of a diseased joint may be thoroughly investigated. As far as diagnosis is concerned, this is absolutely unnecessary. The administration of the anæsthetic, by the removal of the sensitiveness from the joint, removes the necessity which Nature feels for establishing the involuntary muscular protection which she gives all inflamed joints, and

muscular relaxation, as a child will, in many instances, voluntarily stiffen its muscles when first examined, and thus mask the presence of a slight involuntary spasm. The joints should then be moved through all normal ranges of motion, beginning with the sound side, and slight involuntary twitches taken into account. It is usually quite unnecessary to manipulate the joint so violently as to cause pain, in order to arrive at a correct diagnosis, and, in the majority of cases, pain will not be elicited



Right hip-joint disease, showing tilting of pelvis.

thus removes from the surgeon a most valuable means of diagnosis. If the rigidity of the joint is due to adhesions, and so persists after the anæsthetic has been administered, the case has been of such long standing that there should be no difficulty in reaching a diagnosis even by an inexperienced observer.

The mode in which to determine muscular spasm in the early stages of the disease, at which time it is most important to arrive at a correct diagnosis, is, first, to thoroughly gain control of the patient, and cause it to allow complete

unless very extensive movements are made, and unless the limitation of motion which Nature puts to the joint is violently overcome. Pressure over the hip-joint proper may at times give rise to pain; it very frequently does, but in many cases pain cannot be so elicited.

The length of the two lower extremities should now be noted, the distance from the anterior spine of the ilium to the internal malleolus being taken as the most reliable measure; and in this connection care must be exercised that both extremities occupy the same relative posi-

tion to the trunk at the time the measures are taken or they will be of no value, flexion and adduction causing much apparent shortening, while abduction causes apparent lengthening.

The relation of the trochanters to Nélaton's line should be noted, by passing a string from the anterior superior spine of the ilium to the tuberosity of the ischium. Normally this line should just touch the upper border of the great trochanter. If the latter lies above it, the cause may be fracture of the neck of the femur, congenital dislocation of the hip on the dorsum of the ilium, bending of the neck of the femur, absorption of the head or neck of the femur, or absorption of the upper part of the rim of the acetabulum, allowing the femur to glide upward; which cause is present in each case must be determined by the surgeon.

Atrophy of the muscles occurs early in joint disease, and the circumference of each thigh should be noted, both at the upper portion and also at a point lower down,—say, four inches above the knee,—care being taken to measure the thighs at corresponding points, or the results will be useless.

In noting muscular spasm care must be had not to mistake the flaccidity of a paralyzed muscle for the normal state, and suppose the healthy side to be the seat of muscular spasm by contact. The fact that the more relaxed thigh was the smaller ought to clear up any possibility of error, and it would seem that it hardly required mention save for the fact that such mistakes have occurred.

The temperature and pulse should also be noted, any elevation of the former above normal being taken, in a doubtful case of every incipient disease, as conclusive proof that disease is present, espe-

cially if there is present in addition an accelerated pulse.

The amount of elevation of temperature is a fair index of the violence of the inflammatory process.

DISEASE IN THE SACRO-ILIAC joint should be differentiated from hip-joint disease primarily by the position which the patient assumes while standing, the body being sharply bent through the lumbar spine, away from the diseased side, in order to free the articulation from pressure. This position is typical of sacro-iliac disease, is not easy to describe, but, once seen, cannot be mistaken for anything else. Pressure of the two ilia toward each other gives rise to pain by compression of the diseased joint. Pain, in like manner, would be produced if pressure were made with the hands on the great trochanters, which might lead to doubt as to whether the disease were in the sacro-iliac or the hip-joint; but if the disease were in the hip-joint and the pain were caused by pressure with the hands on both trochanters, pain would not be caused by pressing the ilia together with the hands behind the hip-joint, and the diagnosis would be cleared up in this manner. Direct pressure over the sacro-iliac joint also gives rise to pain, and rotation of the hip fails to produce muscular spasm.

CONGENITAL DISLOCATION of the hip may be mistaken for hip-joint disease, but the history is different: there is no history of traumatism, and there is usually no history of pain. The disturbance of gait has been noticed from the first efforts at walking, which generally have been made long after the time at which children ordinarily commence to walk, and there is usually marked prominence of the buttock on the side of the dislocation, and while the child is recumbent the head of the bone can be caused to

glide upon the dorsum of the ilium, while the great trochanter is felt to approach and recede from the crest of the ilium. The only point in common with hip-joint disease is the limp, which, however, is different in its characteristics from the limp of hip disease, and the fact that the great trochanter is above Nélaton's line. In hip disease the trochanter would only be above Nélaton's line in an advanced case, whose history would be absolutely different from that of congenital dislocation of the hip.

Dr. Lorenz's recent visit has brought out many new and important points in fixation and after-treatment. The steps of the operation are as follows:—

1. With the patient lying on the back, the leg and thigh of the affected limb are flexed each to ninety degrees, and the thigh is worked up and down in a line perpendicular to the table. This breaks up adhesions around the head of the femur in its unnatural position. During this and the subsequent steps the pelvis is held firmly by the assistant.

2. With leg and thigh extended, the whole limb is abducted in a plane parallel to the table and worked back and forth to tear the inferior adhesions of the joint capsule and to some degree to stretch the adductor muscles.

3. With leg flexed and thigh about forty degrees from the table, the thigh is repeatedly abducted with great force, each excursion bringing the thigh outward nearer the table, stretching and tearing the adductor group, while at the same time vigorous blows and kneading of the adductor muscles near their origins on the ischium and symphysis serve further to tear their fibres.

4. With leg extended, the whole limb is forcibly and repeatedly flexed on the trunk, and the foot approximates the face—this to break up and stretch adhesions and fibres in the posterior pelvi-femoral group.

5. With the patient lying on the unaffected side, the thigh is forcibly hyperextended to stretch anterior adhesions and muscles.

6. With the patient again on the back, the leg and thigh are flexed and the thigh is strongly rotated again and again.

7. With a wedge-shaped block under the great trochanter as a fulcrum, the flexed thigh is abducted with great force, this serving to break the last adductive fibres and thoroughly to release the head of the bone.

8. Acute flexion and outward rotation of the thigh should cause reduction of the dislocation with a distinct sound as the bone slips into place.

9. With the bone held in place, strong abduction now shows the adductor group to be again shortened, and they must be stretched still farther till they no longer have resiliency enough to tend to throw the head of the femur out of the acetabulum.

10. With the bone still in place, any contractures of the hamstrings which may now have appeared should be stretched.

11. Wadding and bandage are applied in such a manner that the head of the femur is held tight against the acetabulum by turns around the knee and opposite side of the pelvis, and the thigh in extreme abduction (ninety degrees) and to extreme hyperextension. Over this a thigh plaster-of-Paris bandage is applied. As Dr. Lorenz puts it, a child with both hips thus put up "looks like a jumping-jack after you pull the string."

The plaster is kept on six or seven months. The child is encouraged, after a few days, to walk and jump about on both legs, a high shoe making up for lack of relative length on the affected side. The constant impact of femur against acetabulum obtained by the jar of walking is an important factor toward final success.

Dr. Lorenz feels that a good functional, as well as anatomical, result is only likely in cases between three and seven years. The oldest case he has treated is twenty-three years. Where he fails to reduce the hip, the muscle-stretching followed by long fixation of the thigh in the manner already described gives a fair functional result. In one case in Boston, that of a boy 9½

years of age, he was unable to get the head into the acetabulum. Editorial (Boston Med. and Surg. Jour., Jan. 1, 1903).

Confusion may arise at times in regard to FRACTURES OF THE NECK OF THE FEMUR in small children where there is a history of traumatism, pain, and limping, but the diagnosis can usually be made by the fact that the disability and the pain immediately followed the traumatism, and the great trochanter was immediately found to be above Nélaton's line; the only confusion possible being in cases which do not come under observation for months after the occurrence of the symptoms and where no history can be obtained. Such cases often present a picture of flexion and adduction which greatly resembles that of old hip-joint disease with absorption of the head of the femur.

In COXA VARA, caused by the bending of the neck of the femur, the diagnosis is more obscure. In these cases, also, the great trochanter may be above Nélaton's line. The motion of the joint may be limited, but careful investigation of the relation existing between the trochanter and the head of the femur, in combination with the direction of the neck of the femur to the shaft, and differentiation between the limitation of motion produced by spasm of the muscles and that caused by abnormal relations of the neck of the femur, which cause the latter to strike the ilium, will clear up the diagnosis.

At times periostitis of the great trochanter may simulate quite closely hip disease, pressure over the trochanter giving rise to acute pain. If the head of the femur, however, be pressed into the acetabulum by one hand on the middle of the thigh while the knee is abducted with the other, no pain is produced and the sensitive spot is thus located in the

trochanter and not in the head of the femur.

The occurrence of tumors of the femur and ilium should not be overlooked. These are almost always sarcomata, and can usually be differentiated from tuberculosis or syphilis by the rapid enlargement of bone usually following quite soon after a traumatism associated with pain, which is usually caused by pressure on nerve-trunks and does not resemble in its characteristics the night-crises of ordinary hip-joint disease. Muscular spasm is also usually wanting. The importance of a correct diagnosis' being reached very early in such cases cannot be overestimated, as it is only by prompt amputation that life can be saved.

A point to be borne in mind in making a diagnosis of abscess in connection with a fluctuating swelling on the buttock is the possibility of confounding one with an aneurism, as there is on record a case of gluteal aneurism that was opened with fatal result under the impression that it was an abscess. It is always best to confirm the diagnosis by an aspiratory needle.

Etiology.—The ordinarily accepted type of "hip disease" or "morbus coxarius" is a tuberculosis, which in the vast majority of instances begins in the bone, though it may, in exceptional instances, commence with synovial membrane.

How the tubercle bacilli gain access to the bone is a matter which is still under discussion. It is probable that the bacilli are present in the circulation and that under the influence of a traumatism, not necessarily severe, a lowering of the resistance is produced in the neighborhood of the joint sufficient to favor the local development of bacilli which have been present in the general system for a long time, but which had not increased on account of lack of suitable conditions.

Tubercular material was injected by Müller into the femoral artery of animals with negative results. When injected into the crural artery from which the nutrient artery of the femur arises or into the nutrient artery itself, typical bone tuberculosis was set up.

Tubercular matter from phthisical lungs injected into animals' joints sets up tuberculous joint-disease, while injection of inorganic matter not containing tuberculous matter either into the joints or general condition does not cause tuberculosis.

Schüller rendered guinea-pigs and dogs tuberculous by inhaling solutions of tubercular material from diseased lungs and injected the same into the animals' lungs. The joints of these animals were then wrenched or bruised, which produced a typical chronic tubercular synovitis in a great proportion of the cases, while healthy animals whose joints were similarly treated suffered from only a temporary sprain.

The exanthemata are frequently followed by joint-tuberculosis—apparently on account of the lowering of the general vitality below the point where the tissues are capable of resisting the growth of the tubercle bacilli.

Pathology.—In the early stages of hip-joint disease there is an hyperæmia in the cancellous tissue about the epiphyses where the disease usually begins, in the centre of which a small gray tubercle appears.

The capillaries in the Haversian canals become blocked up with bacilli. An hyperæmia is kept up, the trabeculæ in the hyperæmic area are absorbed, enlarged bone-spaces are formed, and fatty degeneration of the bone-cells occurs.

The gray spot in the centre of the hyperæmic area increases in size, its centre begins to grow yellow; other sim-

ilar spots occur and merge into each other; the centre breaks down and becomes a semisolid cheesy mass and may turn into pus.

The blood-vessels in the periphery of the inflamed area often become so blocked that the blood-supply is cut off, and necrosis of a larger or smaller part of the apophysis of the femur results. If all conditions are favorable, the focus may become absorbed or may become calcified, or else as the focus of disease increases in size it may grow toward the surface of the femur, open outside the joint-cavity, and the case may run a comparatively short course with little or no destruction of the joint, or, as is more usual, it may break into the joint itself, setting up a purulent synovitis.

The synovial membrane becomes inflamed and thickened, the blood-vessels are engorged, an increased serous or sero-purulent effusion takes place, and the joint becomes filled with a gelatinous mass, the cartilage becomes eroded, and the bare ends of the bone come in contact.

If the process becomes less violent, on the contrary, the granulations become firmer and not so pale and gradually give place to fibrous tissue, adhesions forming between the joint-surfaces, scar-tissue taking the place of the granulations, and contraction of the capsule limiting motion on the joint.

When the focus of disease is in the ilium, the area of inflammation may advance toward the pelvis as well as toward the acetabulum, and in these cases the periosteum lining of the ilium on its inner side becomes much thickened. At times the entire bottom of the acetabulum may be absorbed and the head of the femur pass into the pelvis; at other times there is only a small hole through which pus passes to form an abscess

which may burst into the bladder or rectum or burrow under the adductor tendons or out on the buttock. Even in this condition recovery is not impossible.

The size of the acetabulum is often increased by the progress of erosion and also by the action of reflex muscular spasm in crowding the head of the femur against the upper rim of the acetabulum. Cases having been reported in which the head of the bone lay inside the pelvis in spite of the limbs' having been kept parallel by plaster of Paris, which had prevented the occurrence of deformity.

The importance of this fact as bearing on the necessity of traction as well as fixation in the treatment of the disease should not be overlooked.

The erosion of the upper part of the acetabulum accounts for part of the shortening in some cases of hip disease. Retardation of growth may give actual shortening of the femur, and it is not unusual to find that the leg and foot of the affected side are also smaller than their fellows.

If the disease progresses sinuses may burrow from the joint in all directions both inside and outside the pelvis, and later on amyloid changes in the liver and kidneys will be set up or a tubercular meningitis or a general tuberculosis may set in.

Prognosis.—Prognosis in disease of the hip-joint varies very much, being largely determined by the amount of destruction which has taken place before the case comes under observation, the amount of recuperative force possessed by the patient, and the intelligence of home co-operation—the last, perhaps, being the most essential element.

Cases of syphilitic disease ought to give excellent results, if to local protection of the joint be added thorough, persistent antisyphilitic treatment.

Cases of acute traumatic synovitis, if seen at once, and given absolute and complete rest, almost always recover perfectly.

Cases of acute, infectious osteomyelitis demand prompt operation and removal of diseased foci. If this can be done before too much general systemic infection has taken place, prompt recovery usually follows.

In tubercular cases, seen early, recovery, as a general thing, takes place. The time which a patient will have to wear a splint is very seldom under two years. If the patient is able to dispense with it inside of this time, it is remarkably fortunate, and the parent should not be led to anticipate such a result. The amount of shortening which may take place, and the amount of impairment of motion, cannot always be accurately determined beforehand, and it is very unsafe to make a definite prognosis. Cases may be seen at apparently the same time after the onset of the first symptoms, with apparently the same amount of disease, be treated in precisely similar manner, and while one recovers with an absolutely-perfect joint at the end of two years, the other may drag on a tedious course of four, five, or six years, and at the end of that time recover with decided shortening and marked diminution of motion. The only difference in the two cases apparently having been the personal equation of power to resist disease. What can be promised is that, if the patient's recuperative force is sufficient to allow it to recover at all, it can recover with a leg parallel with its fellow, and not flexed upon the trunk. And the parents may be told that the length of time during which a splint will probably have to be employed will not be less than two years.

The question of abscess also comes



Comparison between tubercular and healthy hip-joints, showing absorption of the head and neck of the femur, rarefaction of the head, and absorption of the acetabulum. Normal side shows epiphysial cartilage below the head of the femur and cartilage in the acetabulum, where innominate bone has not yet ossified. Bandages and adhesive plasters show on thigh of diseased side. (*Sayre.*)

into the prognosis, and parents are frequently anxious to know whether or not a child will have an abscess. In many cases there is felt at the time of first examination a brawny, porky induration around the hip-joint, which is the forerunner of an abscess, or the child may be found with an inflamed, sensitive joint which absolutely precludes any possibility of motion, and in such cases it is quite probable that an abscess will develop more or less speedily. In other cases, where the patient is seen early, and the brawny induration is as yet not present, no definite prognosis can be given, though the percentage of cases that develop abscesses when thorough treatment is carried out from an early stage of disease is decidedly small.

Treatment.—The indications for treatment in disease of the hip-joint are, primarily, to give the joint physiological rest, and, secondarily, if the general condition of the patient demands special treatment, to counteract syphilis, rheumatism, and so forth, to take such measures as seem demanded.

To obtain rest of a joint like the hip is not easy. The Thomas hip-splint endeavors to secure it by fixing the trunk and lower extremity by means of an iron bar three-fourths of an inch by three-sixteenth of an inch and long enough to extend from the scapula to the lower third of the calf and fitted with cross-bars long enough to embrace three-fourths of the circumference of that part of the body where they are placed, namely: at the thorax, calf, and upper third of the thigh. The splint is padded with felt covered with leather and bent to fit the contour of the body in its deformed position, and then bandaged firmly to it. In acute synovitis of the hip it is an excellent means of treatment, and in cases where no other form of treat-

ment is practicable and capable of doing much good. The fixation which it gives the hip, however, does not counteract the reflex muscular spasm which in chronic joint-disease creates so much of the destruction which is seen in cases left to Nature, and which is capable, in cases which have been simply prevented from having flexion but not treated with traction, of causing perforation of the acetabulum.

Traction in the proper line and of sufficient amount to relieve involuntary muscular spasm and so lessen intra-articular pressure is the best agent we possess for relieving pain in chronic joint-disease and should always be added to any apparatus that is employed for securing fixation, as the latter, unless thus supplemented, but partially fulfills its mission.

Another objection to the Thomas splint is the method by which it straightens the deformity, which is effected by bending the splint backward by wrenches from time to time. If there is contraction of the flexor muscles, this proceeding must result in crowding the head of the bone violently against the acetabulum, thus running the risk of re-exciting inflammation.

In the majority of cases there is too much deformity when they first come under observation to permit the application of a splint. Such cases should be put to bed, a long padded side-splint, with a cross-bar at the bottom, should be firmly bandaged against the sound leg and the trunk as far as the axilla, and the body and leg thus secured may, if necessary, be fastened to the sides of the bed for the purpose of retaining them in position.

It is sometimes found better to bandage the patient with Bradford's frame, a rectangle of iron gas-pipe somewhat

longer and broader than the child, which has canvass stretched tightly across it except at the part where the hips lie, which is left open for a bed-pan. A long board should be placed under the mattress, as the ordinary spring-mattress is too yielding to allow proper control of an inflamed joint. Adhesive-plaster straps, furnished with buckles at one end, are next applied to the diseased limb, the buckles being just above the malleoli, and the plaster extending as high on the thigh as possible. Heavy extension diachylon plaster, spread on mole-skin, is best for this purpose, as the ordinary rubber plaster is irritating to many skins when worn for a long time, and is spread upon such thin cloth as to be incapable of enduring the strain necessary in many cases to afford relief. In applying the plaster it should be warmed but very little, and in many cases need not be warmed at all, but should be snugly bandaged to the skin, and well rubbed with the hand to secure coaptation of the plaster. This tight bandage may then be removed and replaced by one not so closely bound. Some prefer, in addition to the two side-straps of plaster, a spiral of plaster passing around the leg in both directions, which serves to hold the plaster more snugly in position. Properly-applied extension plasters should remain for several months without the necessity of change. To the buckles are now attached small leather straps, which are fastened to a cross-bar below the sole of the foot, from which cross-bar a stout cord extends over a pulley-wheel at the foot of the bed and supports a weight. The amount of weight will vary in different cases, and should be that which experience shows gives the greatest amount of relief in the particular case, and may vary from two to fifteen pounds. The direction in

which the traction is made should be determined by the deformity which is present in each particular case.

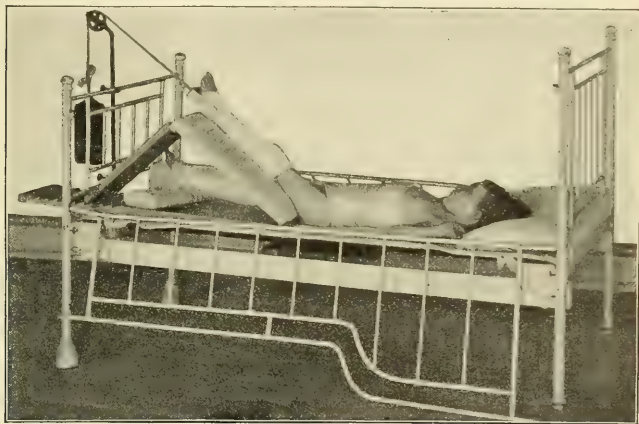
In hip-joint disease two lines of extension are absolutely necessary for the relief of intra-articular pressure. One of these must correspond with the axis of the neck of the femur, because the glutei group and adductor muscles, which are affected by spasm, act upon a line with this axis. The other must correspond with the axis of the shaft, because the iliacus internus and psoas muscles, which are also in a state of spasm, act on a line with the latter axis. All patients with deformity should be put to bed, with extension in the line of deformity and at right angles to that line. In fact, the treatment of any case of joint disease should be begun by overcoming the deformity, as a straight brace cannot be successfully applied to the deformed limb. There is hardly any deformity in joint disease which cannot be best overcome by extension in bed and by forcible means under anæsthesia. After the deformity has been overcome, a lateral traction or fixation brace, devised by the writer, is used, which is perfectly straight and which, when properly applied, will prevent future deformity. The theory that longitudinal traction relieves intra-articular pressure is erroneous. The glutei and adductor groups of muscles are pulled upon, and, by the direction of their origin, any exertion must necessarily force the head of the bone into the socket. Cases treated with this splint seldom recover with ankylosis. It is very important to recognize the fact that no case of hip-joint disease recovers inside of two years, and 75 per cent. of the cases brought to the author have abscess as the result of premature removal of the brace. After the patient has worn the brace for eighteen months or two years and the muscular spasm and the disease have subsided, a walking brace should be applied, which protects the child from injuring the limb if he falls. Joints are frequently seen with all the symptoms of inflammation, which recover within a few months; but this is

simply a transitory condition due to normal inflammation, and if protected such joints will recover. If infection take place, however, disease occurs and the abscess results,—tuberculous, purulent, gonorrhœal, or pneumococcal,—and frequently surgical intervention is necessary. A. M. Phelps (Medical News, May 31, 1902).

When the body and sound leg are firmly bandaged to the side-splint and the back is flat upon the bed, the diseased limb will assume a position either of abduction or adduction, combined with

vated position by pillows or by two boards hinged at one end and supplied with a prop, so as to make an inclined plane which can be raised or depressed according to the needs of the patient. If there is great tenderness behind the trochanter, a blister may be applied with great benefit.

In cases of ostitis of the trochanter with marked tenderness, relief can frequently be obtained by plunging the sharp point of Paquelin's cautery deep into the bone, the skin over the tro-



Extension apparatus.

flexion, and in this position, whatever it may be, the line of traction must be made, and it must be made sufficiently great to give the patient freedom from pain. If traction, so applied, fails to relieve pain, and the position is that of adduction, a second line of traction may be made by passing a well-padded band around the thigh, close to the groin, and making traction outward at right angles to the long axis of the femur, over a pulley fastened to the side of the bed. The leg must be supported in its ele-

chanter having been injected with a drop or two of a 4-per-cent. solution of cocaine. In exceptional cases there may be an effusion in the joint of so great extent as to make aspiration advisable, but this is unusual. If the synovitis becomes purulent the joint must be incised and washed out with Thiersch or Labarraque solution. The line of traction is to be changed little by little every few days, as the spasm of the muscles subsides, until the leg is gradually brought parallel to its fellow and flat in bed,

without disturbing the position of the trunk and the sound leg. When the legs can be made parallel and rest on the bed without tilting the pelvis, a splint may be applied. In some cases the disease will have advanced so far at the time of first observation that adhesions will have formed around the joint too strong to



Sayre's long hip-splint.

permit reduction of the deformity in this manner. And in such cases, where faithful trial of this method of reducing the deformity fails to give results, the patient should be anesthetized and the joint forcibly straightened. If, at this time, it is found that there is so much contraction of the rectus muscle or the

adductors as to prevent reduction of the deformity, except at the expense of violently crowding the head of the femur into the acetabulum, free section of the contracted tissues should be made before reduction is attempted. The joint should then be immobilized either with a splint or with a plaster-of-Paris dressing extending from the ankle to the thorax, while weight-and-pulley traction is again resumed. If plaster of Paris is employed, it should be reinforced at the groin by a strip of iron to prevent cracking. When the deformity has been overcome and the joint is free from active inflammation, the patient may be allowed to rise when supplied with a suitable apparatus.

The object of the hip-splints now in use is twofold: First, to enable the patient to walk about easily without bearing weight upon the diseased joint, and, second, to prevent the joint from receiving the traumatism consequent upon ordinary motion. If the patient is very large and fat or the joint extremely sensitive, it will be found wise to use a pair of crutches in addition to the hip-splint, as the joint in this manner will be better protected and the patient freed from the galling sometimes occasioned by the pressure of the perineal straps in very heavy and fat patients. In the great majority of cases the apparatus most suitable for protecting the joint consists of a pelvis-belt with a bar running down the outer side of the leg to a point a couple of inches below the sole of the foot, where it joins a cross-bar, to which are attached two straps which serve to fasten the instrument to the buckles on the adhesive plaster. By means of a ratchet and key on the foot-piece which is attached to a notched bar sliding inside of the main bar, which is hollow, the splint may be made longer or shorter.

Just above the knee a metal horseshoe-shaped collar holds the thigh in position. Two straps pass from the front of the pelvis-belt to the rear, between the legs, and serve to hold the pelvis-belt in position. The buckles to which these straps are attached should be near together in the front, to avoid pressure on the femoral vessels, and widely separated at the back in order that the pressure may come under the tuberosity of each ischium. An elastic strap runs from the middle of the back bar of the pelvis-belt to the side-rod to prevent the pelvis-belt from tipping up too far in the back. When applied the pelvis-belt is to be fastened sufficiently firm by the perineal straps to prevent it from rising higher than the anterior superior spines of the ilia, while the foot-piece is buckled to the extension-straps, leaving two and a half to three inches between the sole of the foot and the top of the foot-piece. By means of the ratchet and key extension is then made until the patient is comfortable. As the splint projects below the level of the foot, an extra sole and heel must be added to the shoe of the opposite side, which should usually be about four inches high, and the splint should be so regulated that, when the proper amount of traction is made, the patient being upright, the length of the splint and the length of the sound leg with the high shoe will be the same. The splint should be sufficiently long to prevent the patient from touching the foot to the floor, and, if the elevation on the opposite shoe is not high enough to compensate for this elongation, walking will be very uncomfortable. In the majority of cases a splint of this kind gives adequate protection and results in excellent cures. But if it is found that the parents do not fully understand the home management of the apparatus, or if the patient lives

at a distance, so that it is seen at infrequent intervals, it may be wise to add to the splint a thorax-belt, which is joined to the pelvis-belt by means of a rod continuous with that passing down the side of the leg. This form of splint prevents the occurrence of flexion after the patient is allowed to walk, which sometimes takes place with the other splint if improperly applied, but it has the disadvantage of limiting the motions of the patient very materially, and being much more cumbersome. With the patients, however, who live at a distance, and where home co-operation is not intelligent, it is wise to employ it. The mistake must not be made of placing a joint in the bar that runs from the foot to the thorax-belt, as this will render the apparatus worthless. In some cases, also, instead of the perineal bands, it may be better to use a ring, as suggested by Dr. A. M. Phelps, for the latter cannot be tampered with by careless attendants, and, if it is fitted to the limb with proper care and sufficiently well padded, can be used with a fair degree of comfort. In adult cases where dependence can be placed upon intelligent co-operation of the patient, the use of the short traction-splint and crutches may be advisable. In this form of splint the side-rod terminates at the knee-joint and is joined to a pair of hoop-shaped metal bars, which pass across the front of the femur and are supplied with two jaws on each side of the knee just above the condyles. Adhesive plasters are fastened to the thigh, terminating in broad, webbing bands, which are reversed over the jaws of the splint and fastened to buckles. By means of a ratchet and key traction on the joint is made in the same manner as in the case of the long splint.

Statistics of 407 cases of morbus coxarius treated between 1859 and

1889, exclusive of exsections. Of these there were, in the first stage, 118; second stage, 119; third stage, 82; not mentioned, 88. Total number of cases, 407. Results: cured, motion perfect, 71; cured, motion good, 142; cured, motion limited, 83; cured, ankylosed, 5; unknown, 78; under treatment, 14; abandoned treatment, 3; discharged, 2. Died of exhaustion, 2; died of phthisis, 1; died of pneumonia, 1; died of tubercular meningitis, 5. Total deaths, 9. Total number of cases, 407.

Above cases in which the writer knows the result and the kind of splint worn, excluding cases under treatment. Cures with perfect motion: long splint, 19, or 21.59 per cent.; short splint, 54, or 23.12 per cent. Total, 73. Cures with good motion: long splint, 34, or 38.63 per cent.; short splint, 86, or 44.79 per cent. Total, 120. Cures with limited motion: long splint, 29, or 32.95 per cent.; short splint, 49, or 25.52 per cent. Total, 78. Cures with ankylosis: long splint, 3, or 3.40 per cent.; short splint, 1, or 0.52 per cent. Total, 4. Deaths: long splint, 3, or 1.56 per cent.; short splint, 2, or 1.04 per cent. Total, 5. Treated with long splint, 88; treated with short splint, 192. Total number of cases, 280.

The ambulatory treatment in an early stage is extremely unsatisfactory, recumbency and complete rest giving better results.

A persistent high temperature, with no obvious cause in the early stages of hip-joint disease, indicates that the disease will run a rapid and destructive course, and is ominous of an unfavorable end.

Under recumbency and fixation the temperature becomes, if not quite normal, at least constant. R. L. Swan (Med. Press and Circular, May 12, '96).

A communication by the author before the Surgical Society of Paris on resection of hip in cases of tuberculous disease with abscess was followed by a long discussion in which very different opinions were expressed. Félizet strongly supported resection, and considers the conservative treatment unsatisfactory. Of 80 patients with morbus coxæ, aged from fifteen months to puberty, only 9 lived to the age of

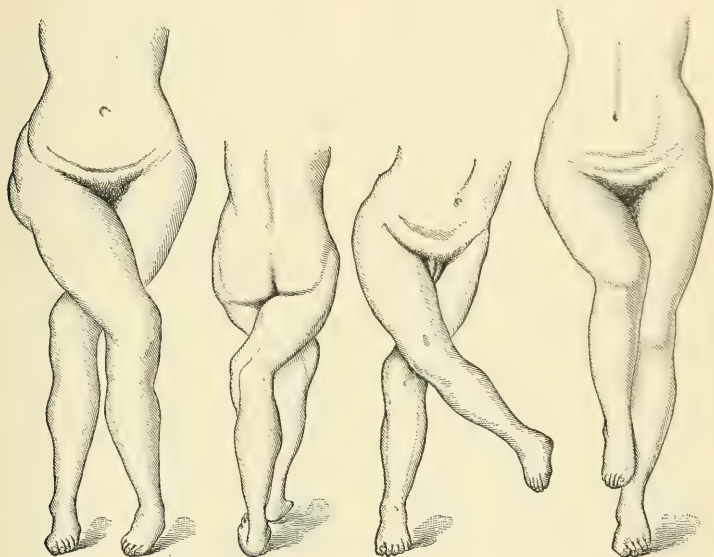
twenty. Of the remaining 71, 20 died from exhaustion, 15 of tuberculous meningitis, many had a secondary infection of other joints, and a large number developed spondylitis. He stated that, of 300 resections of the hip for tuberculous coxitis, he had lost 2 only. In his view albuminuria is the only contra-indication to operation. He does not wait for abscess or fistula, if the hip is painful; if this pain is not removed by extension and immobilization or if the patient has fever and is declining in general condition, he recommends proceeding to the radical operation. Nélaton (Bull. et Mém. de la Soc. de Chir. de Paris, t. xxv, p. 887, 1901).

The treatment of abscesses occurring in tuberculous joints, is one which has been very widely discussed, and in regard to which there have been many different opinions. The prevailing trouble with many surgeons is that they fail to regard the abscess as an incident in the career of a tubercular joint, and treat it as a thing by itself, neglecting the bone-inflammation which was the original starting-point of the abscess. If it were possible to locate the focus or foci of disease and to remove all foci without doing great damage to surrounding healthy parts, the logical treatment of all tubercular inflammation would be the radical excision of all tubercular foci as soon as detected. This proceeding, indeed, became quite fashionable some years ago abroad, but experience has shown that better results are obtained by older and more conservative methods. If we cannot absolutely eradicate all tubercular foci, the chances of securing a good result are better by leaving them alone, provided they remain incapsulated and are not subjecting the patient to general systemic infection. Under rest and compression, good hygienic surroundings, and forced feeding many collections of tubercular matter disappear. If they come to the surface it is the best plan

in many cases to disinfect the skin with great thoroughness, apply a sterilized dressing, and allow them to open spontaneously; wash the cavity thoroughly with peroxide of hydrogen or chlorinated soda (Labarraque's solution). Abscesses treated in this way rarely give rise to any disturbance and usually close in a few months.

would be anything but good treatment. S. L. McCurdy (Med. and Surg. Reporter, Feb. 8, '96).

The writer concludes an interesting article with the following aphorisms: Do not rest content in a case of hip lameness in a young child until you have made a thorough examination of the patient and have obtained a full history of the case. The diagnosis once established, aim to effect a reduction before the sixth



Deformities following hip-joint diseases due to insufficient care during treatment. (Petit.)

Treatment of hip-joint disease is fixation and traction. Excision of abscesses should be performed when they enlarge rapidly, are associated with great pain, are burrowing and producing pressure upon other important structures, or are attended with marked sepsis.

When an abscess appears upon the surface as a tumefaction merely, with no other evidence that it is an abscess than that it is associated with hip-joint disease, to excise and subject the patient to further danger of pyogenic infection

or seventh year. It is fatal to postpone operation. In patients beyond the age-limit, fortify yourself with a Röntgen ray picture in order to determine the exact position of the head, the shape of the same, and the relationship which the neck sustains to the shaft. Do not make long attempts to reduction in patients over 10. Bear in mind the dangers which Dr. Lorenz himself has warned against, namely, too extensive laceration of the soft parts, paralysis which may or may not yield to time and

treatment, the fracture of the femur or the pelvic bones, rupture of an artery, sometimes the femoral. V. P. Gibney (American Medicine, May 30, 1903).

If there has been a mixed infection grafted on top of the original tubercular focus, immediate operation with free incision of the abscess, complete removal of all *débris*, and thorough drainage should be employed. As a usual thing, the abscess has originated in the bone, and in the cavity will be found very frequently some crumbs of dead bone, although occasionally they are not present, while not infrequently, in cases opened at an advanced stage, the abscess seems to have been shut off from the original bone-focus, which has healed up after extruding its carious bone. Many cases pass on to abscess quite promptly, and, indeed, it sometimes seems as if those cases which suppurated early and ran an acute course got well in shorter time than those which were accompanied with less pain and less suppuration. The occurrence of abscess does not necessarily mean a less favorable result, and it is not unusual to see cases of double hip disease, one side having been the seat of an abscess and the other having been free from suppuration, in which the motion is better on the side where suppuration took place.

If great destruction of the head of the femur or the acetabulum are present when the case first comes under observation, or if, in spite of protection and good hygienic surroundings, the case does not do well and disintegration of the joint is progressing, the question of excision presents itself. And here again the difficult problem is when to operate and when not. The great majority of cases, seen in the early stages and properly treated, never reach the point of operation, except in the class of acute infectious osteomyelitis. And, again, there are other

cases which come to the surgeon, with grave hectic symptoms, a hip full of burrowing sinuses, and a mass of dead bone inclosed in a thick involucrum, which have no chance for life except by the prompt removal of all diseased tissue and proper drainage.

[Number of cases of resections of the hip recovered with very good motion. One has almost perfect motion; can run, dance, skate, and walk many miles without the slightest fatigue, although more than 3 inches of his femur and much of his acetabulum were removed; yet he has only $\frac{1}{4}$ inch shortening of the limb. LEWIS A. SAYRE, Assoc. Ed., Annual, '90.]

Ultimate results in 66 cases of hip-joint excisions (by cure is meant that all sinuses have closed, and there is no symptom of trouble about the hip; by relieved, that sinuses are open): There were 32 children discharged cured, 25 died, 3 discharged relieved, 2 discharged not improved, and 4 in the hospital.

Of the cause of death, 14 died from amyloid degeneration, 1 from amyloid degeneration and peritonitis, 2 from general tuberculosis, 1 from acute nephritis, 1 from septicæmia, 1 from heart-failure, 1 from coma (uræmic), 3 from meningitis, and 1 from exhaustion.

Of the patients discharged cured, the present condition of 23 is absolutely known: 1 is well 18 years after discharge; 1 well 11 years after discharge; 2 well 9 years after discharge; 1 well 7 years after discharge; 2 well 6 years after discharge; 1 well 5 years after discharge; 1 well 4 years after discharge; 1 well 3 years after discharge; 4 well 2 years after discharge; 9 well 1 year after discharge. Poor (N. Y. Med. Jour., Apr. 23, '92).

Report of thirty-two cases to support the opinion that osteotomy of the femur in cases of coxitis and similar deformities of the hip is a very successful operation, and is capable of affording the best possible results in the shortest time. Hoffa ("Festschrift der Phys. Med. Gesellschaft Würzburg," '99; Brit. Med. Jour., May 5, 1900).

Between these two extremes we find a third class, in which the surgeon at times is in doubt whether the continued use of a splint for a longer period of years is better, or whether a free removal of the head of the bone, scraping of the acetabulum, and removal of all tubercular tissue may not, in the end, give a better result. Such cases must be decided by each man on his own experience.

In case operation is decided upon, if the patient has a large abscess and is very much exhausted, it is usually better to open the abscess freely and wash it out at one sitting, and in a few days, when the patient has rallied from the removal of retained pus, to complete the clearing away of dead bone, except in cases presenting many old sinuses, where it sometimes is best to unite these by an incision. The best method of reaching the joint is by an incision starting midway between the anterior superior spine of the ilium and the greater trochanter, and, passing over the great trochanter, down the thigh along its outer aspect. This incision should pass completely through the periosteum and extend to a point below the lesser trochanter. By means of a curved bistoury the periosteum should now be divided at right angles to the original cut and, by means of a periosteal elevator, peeled up from the femur. At the digital fossa it will be necessary to resort to the knife to divide the muscles inserted there. At all other points the periosteum can be peeled off by the periosteal elevator. The femur should be sawed just above the lesser trochanter, and the head removed from the socket by means of a pair of lion forceps, or may be dislocated from the acetabulum prior to sawing, at the pleasure of the operator. If there are evidences of disease farther down the shaft of the femur the peri-

osteum must be split lower and the femur sawed in two lower down. The acetabulum should then be explored, and, if any foci of disease exist, they should be carefully removed with a sharp spoon. If the acetabulum is perforated, the opening must be enlarged so that no shoulder of bone shall cause pus to accumulate in the pelvis. Sometimes it is necessary to drain such intrapelvic abscesses through the sciatic notch instead of the acetabulum. If any sinuses exist, they should be carefully cleaned and all tubercular tissue removed as far as possible. The wound should then be thoroughly packed from the bottom with iodoform gauze and the patient placed in a wire cuirass. The wire cuirass consists of a wire frame-work extending from the head to the heels, with a pair of movable foot-pieces, which allow the legs to be lengthened or shortened. The sound leg and the trunk are firmly bandaged in position by a roller bandage. Turns of the bandage also pass over cotton pads in the groin and around the handles of the cuirass and serve to give counter-traction. The diseased limb is then fastened to the foot-board of the cuirass by means of adhesive pieces extending to the thigh, as for the application of a hip-splint, and the foot-board is then drawn down until both legs are of the same length, the bandages just mentioned as passing between the legs keeping the trunk from slipping down. The patient can be dressed in his cuirass, which is cut away under the buttock for this purpose, with much less pain than in any other manner, and can have the benefit of out-door life from the time of operation, being transported in a wheeled carriage.

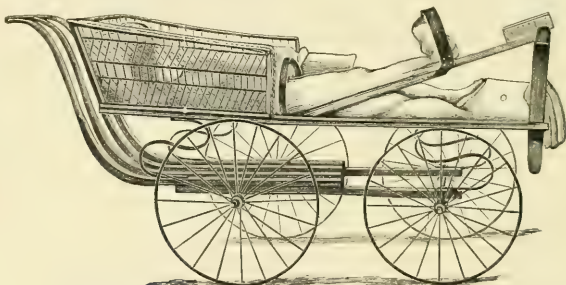
Simple method presented by which recumbency, with any advantage, can be obtained without the counterbalancing evils which attend it when used in the

general way by confining a patient to bed. A light carriage with wicker-work sides, rubber tires, and well-tempered springs is made of a length suitable for the patient, allowing for at least three years' growth; and it is surprising how a child will grow on such a carriage in the fresh air and sunlight. Cut illustrates carriage as used by the author. W. W. Bremner (Med. Record, Aug. 3, '95).

If a cuirass cannot be had a double Thomas hip-splint will answer the purpose if combined with traction by weight and pulley. The wound should be dressed as frequently as may be necessary to keep it clean, the packing gradually being removed as new bone regener-

but this is most uncommon, recovery with a most excellent joint on which the patient walks well having been reported by Dr. J. C. Spencer after the removal of nine inches of femur.

Three consecutive successful amputations at the hip-joint, in which the following procedure was adopted. In the first place, as much blood as could be safely returned to the body from the limb to be amputated, by means of position or elastic bandage, was so returned. Then an incision was made through the abdominal wall about $1\frac{1}{2}$ inches internal to the anterior spine of the ilium. Through this incision an assistant passed his index finger and readily reached and compressed the common iliac artery. Entire absence of bleeding was readily



Light carriage for cases in which recumbency is unavoidable. (Bremner.)

ates from the inner surface of the periosteum, and in some cases Nature will form an artificial joint almost as perfect as its fellow, although this is not to be expected, and a certain amount of shortening and more or less disability usually result.

Cases of double hip disease must be treated by rest in bed or by the use of the cuirass, as it is not possible to apply an apparatus which will allow them to walk in a convenient manner and still protect the joint.

In exceptional cases amputation at the hip-joint may be a necessity to save life,

maintained throughout the amputation which followed. The field of operation was free from bandage or appliances of any kind. The author recommends the procedure on account of its simplicity, its certainty, its aseptic character, and because it can be applied to cases which require that the deeper tissues should be severed at an unusually high level. In performing the amputations, it was found that this method of controlling the artery has the advantage that all the smaller arteries in the stump can be readily identified and ligated, it being only necessary to lift the finger for a fraction of a second and so allow a minute quantity of blood to escape. Charles McBurney (Annals of Surg., May, '97).

All affected structures should be removed, and all healthy bone preserved. The greatest amount of healthy bone preservation and the consequent insurance of best possible joint-function makes early incision imperative. Insurance of best possible function means, besides early evacuation of intra-articular tuberculous products and diseased structure removal, a thorough disinfection. The most effective disinfectant method is the application of carbolic acid and alcohol. The greatest possible obliquity of the upper end of the bone is required if the retention of the femoral extremity in the cotyloid cavity is continued. This must be done by preserving as much of the neck as possible, but a certain obliquity could be obtained by removal of the trochanter major when a portion of the neck is destroyed or removed. A portable extension brace must be used for a long time to insure permanent usefulness of the hip-joint. Excision of the femoral head, neck, and trochanter must, if possible, be avoided. Jonas (Med. Record, Jan. 12, 1901).

Wyeth's method controls the circulation during amputations at the hip and shoulder absolutely, and is the best method devised where applicable. Drainage should not be used in amputations at the hip or shoulder when the operation is done through normal tissues. To secure perfect hemostasis the wound should not be closed until the tourniquet has been entirely removed. Buried absorbable sutures and adhesive plaster should be used in preference to the through-and-through non-absorbable sutures for closing the wound. Immediate operations in cases of injury and timely operations in cases of disease will materially reduce the death rate that now obtains in amputations at the hip and shoulder. M. F. Porter (Internat. Jour. of Surg., Nov., 1904).

If amputation is done, Fernaux Jordan's method should be employed.

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HODGKIN'S DISEASE. See PSEUDO-LEUKÆMIA.

HOMATROPINE.—When atropine or hyoscyamine is heated with baryta-water, the alkaloid is resolved into tropine (an artificial alkaloid) and tropic acid. Tropine, mandelic acid, and dilute hydrochloric acid are then mixed, and a prolonged, gentle heat is applied; when the mixture is evaporated homatropine crystallizes out in deliquescent, colorless, regular, prismatic crystals. Homatropine is freely soluble in alcohol, ether, chloroform, and oil; more slowly in water. Its salts with hydrochloric, hydrobromic, and sulphuric acids are white and crystallize well. In therapeutic practice homatropine hydrobromate is most generally used. It occurs in small, white, lustrous, non-hygroscopic crystals, and is soluble in 10 parts of water. The solution is quite permanent. For internal use homatropine may be taken in doses of $\frac{1}{120}$ to $\frac{1}{60}$ grain.

Physiological Action.—The physiological action of homatropine closely resembles that of atropine. It dilates the pupil very rapidly and energetically, but the effect passes off in 36 to 48 hours. The mydriasis of atropine lasts for 10 to 14 days, and that of hyoscyamine for 8 to 9 days. Repeated instillations of homatropine solution (1 per cent.) causes a lowering of the pulse-rate, which is, however, only temporary. Slight hyperæmia of the conjunctiva almost invariably follows its use. Instillations of strong solutions (4 to 5 per cent.) induce a burning sensation on the conjunctiva, and, if in large amount, its bitter taste becomes perceptible, but without the dryness of the pharynx which follows the use of atropine. The action of homatropine on the circulation also differs from that of atropine in that the former lessens the pulse-rate and diminishes the arterial pressure. Unlike atropine,

again, it does not, as atropine often does, superinduce cutaneous eruptions.

Poisoning by Homatropine.—No fatal cases of poisoning have been reported from the medicinal use of this remedy, and no toxic symptoms beyond a slight drowsiness. This, no doubt, results from the fact that the use of homatropine is almost exclusively by instillation in ophthalmology. De Schweinitz and Hare, in experiments on frogs, have found that this drug in large doses first alters the respiration to the Cheyne-Stokes rhythm, then arrests it wholly; this is succeeded by a tetanic condition; and after that by a paralysis—leaving, however, the peripheral nerves and muscles untouched. The heart-movement is retarded and the pulse-rate diminished. Death occurs from respiratory paralysis.

An undoubted instance of poisoning following the instillation of 1 drop of a 0.2-per-cent. solution of homatropine. C. A. Oliver (Amer. Jour. Med. Sci., Nov., '96).

Case of a girl, aged 3 years, who received nine applications of a solution containing 2 per cent. each of homatropine and cocaine to the eyes in ninety minutes. Three hours later she failed to recognize familiar faces, picked at the coverlit, tried to grasp invisible objects, babbled strangely, and persisted in getting out of bed. Her pupils were widely dilated, her face flushed, her lips and tongue parched. There was no eruption. She recovered entirely within twenty-four hours. S. Stephenson (Ophthalmic Review, July, 1900).

Treatment of Poisoning by Homatropine.—The treatment of poisoning by this remedy is similar to that of atropine poisoning. The stomach, by emetics and the stomach-tube, is to be evacuated. Tannin and animal charcoal are then administered and emetics again given, followed by castor-oil. Artificial respiration, heat, stimulants, and hypodermics of strychnine are useful to support the

respirations. Morphine may be given carefully as a physiological antidote.

Therapeutics.—Homatropine is almost exclusively used by ophthalmologists to dilate the pupils and paralyze the muscle of accommodation for the purpose of correcting anomalies of refraction in healthy eyes. For this purpose it is used in solution (4 grains to the ounce of distilled water), which is dropped into the eye every five or ten minutes until sufficient dilatation is obtained. For therapeutic uses in ophthalmology, atropine is generally used, although for incipient cataract Risley prefers homatropine, especially where there is discomfort without increased ocular tension.

Homatropine is a cycloplegic of the greatest value, and the evidence upon which some have rejected it is very meagre. It does not possess the surplus power of atropine, and therefore it must be used with greater care. Carelessly used solutions of atropine will produce very marked dilatation of the pupil; if directions be given for two or three instillations a day, and if only one of these is effective, it will probably produce full mydriasis. In the last 1000 patients upon whom the drug was used there were 22 in whom the incomplete paralysis of accommodation was suspected. These were examined under a stronger mydriatic, and of the 44 eyes only 6 showed a higher refractive error than was noted under homatropine.

Some samples of homatropine are irritating. Especial care should be taken in bringing the solution in contact with the cornea not to have it strike from a considerable distance. The amount of the drug commonly employed is from $\frac{1}{16}$ to $\frac{1}{4}$ grain. This rarely produces constitutional symptoms. Edward Jackson (Annals of Ophthal., Jan., 1901).

Homatropine has been used against the night-sweats of phthisis, but other remedies are preferable.

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Philadelphia.

HUTCHINSON'S TEETH. See SYPHILIS.

HYDRACETIN.—This substance—known also as pyrodin (not to be confounded with pyridine), acetyl-phenyl-hydrazin, phenyl-acetyl-hydrazin, and phenacethydrazin—is produced by the reaction of phenylhydrazin with acetic anhydride. It occurs in hexagonal prisms or tablets of a silky lustre, without taste or odor. It is freely soluble in alcohol and chloroform and in 50 parts of water.

Physiological Action and Dose.—Wild has found that this substance is without effect on the voluntary muscles, while upon the heart-muscles in large amounts it acts as a depressant and lowers blood-pressure by a direct action on the vasomotor centre, and not by any action on the blood-vessel wall. It acts as a depressant upon the spinal cord, and lowering reflex action by its direct effects, and not by acting upon the nerve-trunks. It is a powerful antipyretic, analgesic, and antiparasitic, but an uncertain and dangerous one. The dose of hydraceticin should not exceed $\frac{1}{2}$ to 3 grains *per diem*, in divided doses.

Poisoning by Hydraceticin.—Given in repeated doses, hydraceticin has a cumulative effect, and produces jaundice due to commencing hæmoglobinæmia, with malaria, weakness, and a kind of angina. Less than 4 grains has produced cyanosis of the face and extremities, coldness of the latter, reduction of the temperature to 95° F., profuse sweats, acceleration and then retardation of the pulse, and an almost complete disappearance of the pulse and respiration. The urine becomes intensely dark red in color, and contains methæmoglobin, urobilin, and masses of amorphous, reddish-brown granules. The red corpuscles become

discolored and show little tendency to form *rouleaux*. It is a powerful blood-poison, its distinctive action on the red corpuscles being analogous to that of chlorate of potassium, pyrogallol, etc. Grave anæmia results, even from external use of this drug.

Treatment of Poisoning by Hydraceticin.

—Acute poisoning calls for the use of cardiac and respirative stimulants, heat, respiration, and evacuation of the stomach. Chronic poisoning has been successfully treated by the free use of milk, followed by ferruginous and other tonic remedies.

Therapeutics.—Hydraceticin has been used internally in rheumatic and other fevers, locomotor ataxia, and neuralgias. In a 10-per-cent. ointment it has been used in psoriasis.

The use of this remedy is attended with so much danger, and requires the exercise of such great caution, that its employment is strongly advised against, since it possesses no advantage over other remedies already in use. Further experiment with this drug should be abandoned.

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Philadelphia.

HYDRARGYRUM. See MERCURY.

HYDRARTHROSIS. See JOINTS.

HYDRASTIS.—Hydrastis, U. S. P., is the rhizome and rootlets of *Hydrastis Canadensis*, or golden seal. It is a small, perennial herb found in rich, moist woodlands throughout the United States, mostly in the northern and western portions. The dried herb has little odor and a peculiar, bitter taste. Hydrastis contains two principal alkaloids, hydrastine and berberine; a third alkaloid, xanthopuccine, is found in very small

quantity. Although berberine is found in greater amount than hydrastine, the latter is the characteristic alkaloid. Berberine is found in numerous other plants (*Berberis vulgaris* et al.).

Hydrastine crystallizes in white, four-sided rhombic prisms; it also occurs in an amorphous form. When pure it is almost tasteless, being very sparingly soluble in water, but freely soluble in alcohol, ether, chloroform, and benzin (benzole). It forms salts with the acid, which are acid and bitter.

Hydrastine is an artificial alkaloid produced from hydrastis by a process of oxidation. It also forms salts, one of which is official, the hydrochlorate (hydrastininæ hydrochloras, U. S. P.); this salt is soluble in water.

Berberine crystallizes in yellow needles which have a bitter taste. It is soluble in hot water and alcohol, but insoluble in ether.

Preparations and Doses.—Extract of hydrastis, fluid, $\frac{1}{2}$ to 2 drachms.

Glycerite of hydrastis.

Tincture of hydrastis, $\frac{1}{2}$ to 1 drachm.

Hydrastine hydrochlorate, $\frac{1}{12}$ to $\frac{1}{2}$ grain (maximum dose, 2 grains *per diem* in divided doses).

Berberine, $\frac{1}{2}$ to 15 grains.

Physiological Action.—Hydrastis, like other bitters, promotes the secretion of the saliva and gastric juice, and thereby increases the appetite and digestive power. It also increases the secretions of the intestinal glands and of the liver. On the nervous system hydrastis has effects similar to those of quinine, but less marked. Porak's experiments demonstrate that hydrastine is a heart-poison, acting on the vasomotor system centrally. It is, therefore, uncertain and dangerous. Its derivative hydrastine has no action on the heart, and but feeble action on the blood-pressure. It

appears to act directly upon the capillaries, its vasoconstrictive power being greater and more permanent than that of either hydrastine or ergot. Its action on the uterus is slight.

Hydrastine, intravenously injected in the proportion of $\frac{1}{64}$ grain for every 2 pounds of body-weight, produces constant diminution in the volume of kidneys. In doses of $\frac{1}{32}$ to $\frac{1}{64}$ grain for every 2 pounds of body-weight the blood-pressure increases; the pulse is also increased by small doses. Large amounts diminish both pressure and the frequency of the cardiac beat and increase the systolic contraction of the heart. Hydrastine, in small quantities, diminishes the caliber of the blood-vessels. The acceleration of pulse is attributed to excitation of the accelerator nerves of the heart; the subsequent slowing to stimulation of extracardiac centres of the pneumogastric nerves. Hydrastine stimulates spinal centres, followed by clonic and tetanic convulsions, and finally paralysis. The drug has a certain cumulative action, and is eliminated by the kidney particularly. No traces of it were found in the bile. Marfori (Gaz. Méd. de Paris, June 7, '90).

Poisoning by Hydrastis.—In poisonous doses hydrastis may cause convulsions, followed by paralysis, according to the quantity of the alkaloids present. Hydrastine is more convulsive in its effects than berberine. When injected into the jugular vein, hydrastine causes a primary fall of arterial pressure, succeeded by a decided rise, and the studies of Cerna have shown that it is an active poison, producing spinal convulsions, followed by paralysis (Hare). No fatal cases of poisoning by this drug have been reported.

Hydrastine is poisonous to both cold- and warm-blooded animals; hydrastine destroys the irritability of the muscular tissue; very large quantities produce loss of the functional activity of the efferent or sensory nerve-fibers, and also cause anæsthesia, when locally applied; in

small amounts, it increases reflex activity by stimulating the spinal cord; later in the poisoning, by large quantities, hydrastine diminishes reflex action by stimulating, at first, Setschenow's centre in the medulla oblongata, and afterward abolishes it by paralyzing the spinal cord; the paralysis produced by the drug is due to an action upon the muscles, the motor nerves, and spinal cord; the convulsions of hydrastine are of spinal origin; hydrastine destroys the electro-excitability of the cardiac muscle; the alkaloid, in small doses, produces a primary frequency in the pulse-rate, due, probably, to a stimulating action on the cardiac motor ganglia; in moderate and poisonous amounts it diminishes the number and increases the size of the cardiac beats by an action upon the intracardiac ganglia and the heart-muscle itself; hydrastine lowers arterial pressure by a direct action on the heart, and also through a paralyzing influence exercised upon the centric vasomotor system; the drug produces at first an increase and afterward a decrease in the number of the respiratory movements; hydrastine kills by failure of the respiration; the alkaloid lowers bodily temperature, the drug increases peristalsis; in hydrastine poisoning the salivary and the biliary secretions are largely increased, especially the latter; hydrastine, locally applied, produces at first contraction of the pupil, afterward dilatation of the same. David Cerna (*Therap. Gaz.*, May, '91).

Case of poisoning in a man, about 65 years of age, who was ordered to take 20 drops of the liquid extract of hydrastis *Canadensis* three times daily on account of bronchitis with copious expectoration. He had taken two doses, the last one at bed-time. Soon afterward he experienced difficulty of breathing, became livid, his respiration rapid, with powerful action of the auxiliary muscles of respiration. Inspiration rales could be heard from a distance, and expiration was accompanied by a whistling sound. No dullness could be found on percussion of the lungs, but on auscultation a fine general crepitation was noted. After the use of stimulants improvement gradually took place. As

no cardiac murmurs could be heard during the attack, the drug probably caused the symptoms by inducing cardiac weakness, with secondary congestion and oedema of the lungs. F. Miodowski (*Berliner klin. Woch.*, Jan. 30, '99).

Case of poisoning due to fluid extract of hydrastis. A girl of 22 years, because of marked uterine hæmorrhage following abortion, took about 3½ drachms of this drug. She soon became affected with nausea, vertigo, faintness, restlessness, and headache; and then with hallucinations, dyspnoea, and precordial oppression. The symptoms improved, and the patient was discharged cured after a few days. Friedeberg (*Centralbl. f. innere Med.*, Oct. 18, 1902).

Therapeutics.—Hydrastis is indicated whenever the tone of a mucous membrane is lowered in hæmorrhagic conditions and in malaria.

CATARRHAL DISORDERS.—We find it beneficial, as a rule, in subacute or chronic catarrhal troubles: in chronic gastro-intestinal catarrh, in catarrh of the duodenum and gall-ducts with subacute jaundice, in catarrh of the uterus and vagina with leucorrhœa, in catarrh of the bladder and urethra, chronic nasal catarrh, etc.

Good results obtained from use of fluid extract of hydrastis, in doses of 20 or 30 drops four times a day, in tuberculous subjects. The drug is superior to all others for phthisical cough. Sanger (*Revue Inter. de Méd.*; *Revue Méd.*, Jan. 5, '98).

The conditions resulting from, or due to, the above are relieved by hydrastis: atonic dyspepsia, constipation due to deficient secretion, and spermatorrhœa.

MALARIA.—Hydrastis is an excellent remedy in the treatment of intermittent and in chronic malarial poisoning, when cinchona preparations cannot be obtained.

HÆMORRHAGE.—In the hæmorrhage of puberty and the menopause in hæmorrhage associated with lesions of the ap-

pendages, and in the uterine congestion of dysmenorrhœa, hydrastine hydrochlorate, in doses of 1 $\frac{1}{2}$ grains per diem (in divided doses), will be found efficient. The fluid extract, in daily doses of 100 to 150 drops, given in divided doses, will arrest the hæmorrhages occurring during pregnancy and the puerperium.

Administered to 97 cases of uterine hæmorrhage from various causes, with complete or partial success in 47 of them. Recommended for preventing flooding of any kind. Hach (Proceedings Riga Society Med. Practitioners, '87).

Drug found useless in the hæmoptysis of phthisis. Krannhals (Proceedings Riga Society Med. Practitioners, '87).

Fluid extract of hydrastis, 20 to 30 drops, repeated several times daily, recommended in cases of hæmoptysis. Koeniger (Ther. Monats., No. 11, '88).

Twenty minims of the fluid extract four times daily used for menorrhagia in a case of uterine fibroids. The bleeding was completely arrested, and in three months' time the patient menstruated regularly. J. M. Fuchs (Med. Press and Circular, Jan. 25, '88).

The drug is of especial value in hæmorrhages of the menopause, when there is no organic change in uterine tissues.

In cases of myoma the results were unsatisfactory. The tincture of hydrastine produced good effects in cases of atonic dyspepsia and general debility, commonly met with in women who have suffered from menorrhagia. Local use as important as internal administration; it has given excellent results in chronic endometritis, cervical erosions, and congestive states of the uterine cervix. It may be applied as a cervical dressing on the vaginal tampon, or added to the water used for the hot douche. H. M. Jones (Med. Press and Circular, June 25, '90).

In obstetrical cases hydrastis is dangerous neither to the mother nor the child. It exercises a curative and prophylactic hæmostatic action on the uterus during pregnancy and at the time of accouchement. The fluid extract rec-

ommended in the hæmorrhages during pregnancy and during the puerperal period, in amounts of from 100 to 150 drops *per diem*, divided into five doses; as an immediate curative agent in hæmorrhage during accouchement, given to the extent of from 150 to 200 drops, in three or four divided doses; at the beginning of labor-pains in cases of placenta prævia; during dilatation, and in other cases; and, finally, as prophylactic measure against the frequent uterine hæmorrhages occurring at delivery or post-partum in cases of hydramnion, uterine inertia, and excessive development of the fœtus and its membranes, or as the result of a profound anæmia of the patient or of the predisposition to flooding persisting from previous labors. Bossi (Nouvelles Arch. d'Obstét. et de Gynéc., '91).

Hydrastis found of service in the treatment of the night-sweats of a large number of cases of hæmoptysis. The dose employed was 30 minims of the fluid extract. Cruse (Cincinnati Lancet-Clinic, Oct. 3, '91).

Hydrastine is a heart-poison, acting on the vasomotor system centrally. It is an uncertain and dangerous remedy. Its derivative, hydrastinine, has no action on the heart, and its action on the blood-pressure is feeble. Its vasoconstrictive power is much greater and more permanent than that of either hydrastine or ergot. Its action on the uterus is very slight. When a vigorous contraction of the uterus is desired, ergot is to be selected. In the hæmorrhages of puberty and the menopause, in those accompanying lesions of the appendages, and in the uterine congestion of dysmenorrhœa hydrastinine is preferable. In the case of uterine fibroids and endometritis its action is only palliative. It is best to give frequent doses, continued for many days in succession. Its administration should be begun before the commencement of the expected menorrhagia. Porak (Bull. de la Soc. de Méd. Prat., Mar. 15, '92).

Hydrastine has no influence upon the physiological loss of blood during and immediately after labor; it has no influence upon the evolution of the uterus;

it lessens the frequency and intensity of the pains, especially in multiparæ; it does not arrest puerperal hæmorrhage; and it exerts no influence upon the expulsion of clots from the uterus. Luigi Borde (Bull. delle Scienze Mediche, Dec., '92).

Ten-drop doses of *hydrastis Canadensis* given in water every two or three hours is a sovereign preventive of epistaxis. Kohn (Med. Record, June 9, '94).

Hydrastinine given in eighty-six cases of uterine hæmorrhage, the form employed being $\frac{1}{2}$ -grain pills, 1 of which was ordered three times a day. The treatment was well borne, but patients frequently complained of painful uterine contractions. The most constant and remarkable effects were observed in hæmorrhage due to retro-uterine hæmatocele, an immediate arrest of hæmorrhage being obtained in all the five cases of this character. In functional menorrhagia considerable success was obtained; here 2 pills daily were ordered a day or two before the expected period, 3 being taken as soon as it commenced and continued until its cessation. In hæmorrhage after abortion hydrastinine was usually efficacious, as also in cases due to lesions of the appendages. It was of far less benefit in hæmorrhage due to chronic endometritis, to commencing abortion, and to uterine fibromata, though in all these classes of cases it sometimes proved useful. With hæmorrhages due to malignant disease no effect at all could be traced. Kallmorgen (Lancet, June 16, '94).

Hydrastinine is distinctly more powerful than ergot; the arrest of hæmorrhage is prompt. The alkaloid is a powerful ecboic. H. C. Wood (University Med. Mag., Aug., '94).

In tuberculous hæmorrhages *hydrastis* is the best pulmonary hæmostatic. Hæmorrhages of dysentery have been completely suppressed with this drug after all other measures had failed.

Attention particularly called to the favorable and almost invariable effect that *hydrastis* exercises on hæmorrhoids, whether internal or external. Strangulated or irreducible hæmorrhoids are reduced with greatest facility.

As an oxytocic, it is not so rapid in its action as quinine.

It is the preferable remedy in the hæmorrhages of fibromyomas, and is the best means of combating the hæmorrhages of pregnancy at any stage, provided it is taken at sufficiently prolonged intervals—that is, 20 drops every three hours, or four times a day. Mariani (Indépendance Méd., Apr. 17, '98).

It is the main drug used to control hæmorrhage, hæmoptysis, epistaxis, purpura, hæmatemesis, enterorrhagia, and hæmaturia, but especially metrorrhagia, except when it occurs in uterine cancer. The fluid extract is the best and most widely used, and hydrastinine hydrochlorate should alone be used. E. Tournier (Jour. des Praticiens, May 11, 1901).

The rationale of the hæmostatic influence of *hydrastis* has been explained above; hence, when uterine contraction is desired, ergot is to be preferred, as *hydrastis* does not act on the muscular fibre of the organs, but on the vasoconstrictors.

Small doses of hydrastine— $\frac{1}{40}$ to $\frac{1}{25}$ grain per 2 $\frac{1}{2}$ pounds' weight of the animal—are sufficient to bring on uterine contraction. The action upon the uterus is different from that of ergot, in that it is of central origin. K. Serdzew ("Das Pharmakologische Verhältniss des Hydrastins zum Blutgefässsystem und zum Uterus," '90).

Power of hydrastine to cause uterine contraction denied. P. Baumm (Ther. Monats., No. 12, '91).

Abortion can be produced—not only at term, but also in the middle of conception—in rabbits, mice, and dogs by the use of hydrastine. P. Archangelski (Meditzinskoje Obozrenije, p. 52, '91).

TOPICAL APPLICATION.—In stomatitis and follicular pharyngitis the glycerite of *hydrastis* or the fluid extract will prove an active remedial agent.

Unhealthy and sloughing sores, old ulcers, sloughing cancerous growths, and

chancroids are favorably influenced when dressings of hydrastis are employed.

C. SUMNER WITHERSTONE,
Philadelphia.

HYDROCELE. See PENIS AND TESTICLES.

HYDROCEPHALUS.

Definition.—Hydrocephalus means an accumulation of serous fluid within the cranial cavity. The condition is frequently spoken of as dropsy of the brain, or as “water on the brain,” and may occur as an acute or chronic affection. The location of the fluid varies, but is more frequently found within the cerebral ventricles than outside the brain or between its membranes.

Varieties.—The term “internal hydrocephalus” is applied expressly to chronic hydrocephalus usually congenital in origin, and when the word *hydrocephalus* is used without qualification it is this variety of the disease which is universally meant. Hydrocephalus may be *primary*, or *secondary* to some other disease.

Acute hydrocephalus is nearly always secondary to basilar meningitis, while chronic hydrocephalus is more frequently primary, and very often congenital; it also often develops after birth without any apparent antecedent cause. Hydrocephalus has also frequently been classified as congenital and acquired; but since many of the cases, apparently beginning after birth, really owe their origin to the same obscure causes which determine the congenital cases, it would seem better to regard the condition as *acute* or *chronic*, and as *primary* or *secondary*.

I. Acute Hydrocephalus.

Definition.—Acute hydrocephalus means an effusion into the ventricles or

within the membranes of the brain, as the result of an inflammation of the pia mater usually, either simple or tubercular, or it may result from other intracranial or systemic organic disease.

Symptoms.—The symptoms of acute hydrocephalus necessarily depend for their mode of development on the cause producing the effusion, and, as meningitis of some grade is the most frequent cause, the signs of this disease very often precede and accompany those dependent upon the intracranial effusion. In other cases arising from gradual mechanical obstructions to the return venous circulation, the onset of symptoms indicative of ventricular dropsy may be most difficult to determine; so that, especially if other serious illness—such as summer diarrhoea of infancy or one of the specific fevers—complicate the case, the diagnosis may be conjectural or even impossible. In such cases the meningeal affection sometimes runs a subacute course and gradually subsides, leaving an effusion which may, in rare cases, be absorbed again, but which more usually tends either to remain stationary or to slowly increase in amount until the characteristic physiognomy of the hydrocephalic head is developed, and more or less permanent injury to the brain results, although such patients may survive for years in fair health.

Commonly, however, the signs of acute hydrocephalus appear during the course of one or other of the conditions to be referred to under etiology. When the primary disease is acute non-tubercular basal meningitis, the child stricken with this disease is apt to be fretful, irritable, restless, and sleepless, for from a few days to a week or two. Headache is another early symptom, and is usually combined with intolerance of a bright light, while the face is flushed and the

anterior fontanelle pulsates strongly. At this early period there may also be strabismus of irregular degree. Vomiting is frequently an early symptom, and may be an extremely marked one. The temperature is that of moderate fever, but in severe cases there may be hyperpyrexia during the first two or three days or even longer. The pulse is in some cases distinctly slow and rather full, but in others much accelerated in rate and small in volume, or these conditions of the pulse may vary or alternate. The respiration is often shallow and irregular, and, after actual ventricular effusion has occurred in sufficient amount to cause compression of the brain, Cheyne-Stokes respiration is frequently noted, especially in the later stages of the disease. According to the severity of the cause producing the effusion coma develops slowly or suddenly, with twitchings and rigidity of a limb, or of all the limbs. This tremor and stiffness of the muscles may include the neck and spinal muscles, and twitching movements of the facial muscles or of the head are very common. In the rapidly-fatal cases the coma deepens, the pulse and respiration progressively fail. The face is void of expression, the eyes present marked contraction of the pupils, with occasional irregular movements of the ocular muscles, convulsions may occur and be repeated many times, and the little patient dies from failure of the respiration and of the heart's action.

In some of these severe cases, inflammatory in nature, there is often a marked remission of all symptoms, including the regaining of consciousness, a lessening of the spastic condition of the muscles, and a decided improvement of the general condition. This change for the better is too often a deceptive one, and is followed by a return of the same grave

symptoms noted above preceding death. In cases of simple non-tubercular basilar meningitis the improvement may be real and the patient slowly recover, and after some months the recovery may be a perfect one. It is more common, however, that some permanent mental or physical defect is left as the result of the effusion, and such patients are a long time in recovering from the very marked emaciation which always is present and in some cases is extreme.

The course of the disease may be extremely variable, and the duration from a few days to many months. In such cases the characteristic hydrocephalic head may develop, and the case very much resemble one of chronic hydrocephalus. This variability in this disease we must assume to be directly dependent upon the grade and extent of the primary inflammation, which in certain cases runs a subacute or almost chronic course which may finally end in more or less perfect recovery. Even in the most favorable case, when effusion has taken place into the ventricles, it is extremely rare that this effusion wholly disappears. The clinical and post-mortem evidence is strongly in favor of the view that when effusion once occurs it is, at best, only permanently limited in the favorable cases, the brain gradually accustoming itself to the changed conditions, while the majority of the cases show a tendency toward progressive increase of the ventricular accumulation.

When tubercular meningitis is the primary condition, the same prodromal symptoms are usually noticed as have been above noted as ushering in non-tubercular meningitis. At times the onset is very acute, but it is more apt to be gradual, with slowly-rising temperature, which does not commonly run so high as the temperature-curve of typhoid fever,

nor does it often exhibit the very marked remittency usually observed in that disease. Irregularity of the pulse, some changes in the respiration-rhythm, retraction of the abdomen, irregularly-contracted pupils, slow and irregular lateral movements of the eyeballs and unilateral or bilateral flushing of the face, the *tache méningique*, gradually develop. A violent convulsion, followed by hemiplegia with involvement of the face, may be the next symptom, and it may or may not be preceded by twitchings of the facial and orbital muscles. In many cases amaurosis, ptosis, strabismus, or facial paralysis alone may be noticed after a convulsion. Drowsiness may be present from the beginning of the illness, but coma comes on early or late, according to the severity of the case, and the clinical picture is one of coma slowly ending in death.

The symptoms attending the course of other conditions producing acute hydrocephalus, and non-inflammatory in nature, naturally depend upon the nature of the obstruction to the venous circulation and the manner of its occurrence. In cases arising from enlargement of the bronchial glands the cerebral effusion may accumulate very slowly and be unsuspected until the case is far advanced, when prominence of the fontanelles with absence of pulsation, some increase in the size of the cranium, coupled with gradual on-coming stupor, tremors, convulsive seizures, or some form of paralysis may direct attention to the cerebral condition. The clinical course of these cases, which are fortunately of rare occurrence, is extremely variable, and the same may be said of the symptoms presented before actual dropsy of the ventricles occurs, and evidences of intracerebral pressure become manifest, so that such forms of the disease, while they

may develop acutely, approach very closely and often run into chronic hydrocephalus. In all cases of acute hydrocephalus the changes in the shape and size of the skull may be very slight, and if the disease occurs after the ossification of the cranial bones, such changes cannot be detected by measurements.

Etiology.—Any cause which operates by obstructing the venous circulation within the cranial cavity may cause an acute effusion of serum into the ventricles or elsewhere within the skull. Thus, intracranial tumors, enlarged bronchial glands, retropharyngeal abscess, and intracranial hæmorrhage are all causes of more or less acute hydrocephalus.

Adult internal hydrocephalus, apart from acute meningitis, is almost always due to subtentorial tumor, and is, indeed, a very common consequence of such a tumor. The tumor causes the hydrocephalus by (a) compressing the veins of Galen, (b) compressing the outlet from the lateral ventricles, or (c) compressing both. William Gordon (*Lancet*, Jan. 9, '97).

The same is true of certain diseases which cause, at times, enlargement of the bronchial glands, and thus, by pressure on the *venæ innominatæ*, obstruct the venous circulation of the brain, resulting in passive congestion and effusion of serum from the engorged blood-vessels. Acute hydrocephalus has also been frequently noted in connection with exhausting diseases, like severe cases of scarlet fever, typhoid fever, and prolonged diarrhœa of children, especially that occurring in summer.

Two cases, in children, of very marked hydrocephalus, with convulsions, spasmodic rigidity of limbs, exaggerated knee-jerks, and total blindness. Gastro-intestinal disturbance was in each case the starting-point of the affection. Marfan (*Sem. Méd.*, Aug. 21, '96).

Four cases of acute idiopathic internal hydrocephalus. Idiopathic acquired internal hydrocephalus is a disease *sui generis*; the fulminating form may recover, but the slower, insidious form is fatal. The disease is produced by exposure to cold, and is to be looked upon as a vasomotor reflex neurosis. Heidenhain (Berliner klin. Woch., Dec. 4, '99).

In the latter class of cases the effusion is partly the result of the actual wasting of the brain, which favors passive congestion of the organ, and is also due, in part, to the great weakness of the circulation, which is a special feature of protracted cases of infantile summer diarrhoea. Syphilitic meningitis may also be accompanied by an acute effusion into the ventricles, and in all of these cases a careful study of the family history, and a very critical examination of the patient, should be made so as to discover, if possible, other evidences of the existence of syphilis.

Syphilitic hereditary hydrocephalus is divisible into cases in which the hydrocephalus is the only sign of congenital disease; cases in which it follows on specific cerebral symptoms produced by a thickened ependyma. The eruption and other symptoms of congenital syphilis may appear some weeks before, simultaneously with, or some time after, the hydrocephalus. In the last case the hydrocephalus is the first symptom of hereditary syphilis. Of 170 cases collected by E. Fournier, 5 were improved and 6 cured by specific treatment; the rest died. Personal case reported in which a successful result was obtained by means of specific measures continued one year. Audeoud (Rev. Méd. de la Suisse Rom., Jan. 20, '99).

Finally, certain writers have reported cases of so-called essential dropsy of the brain, in which there could be found no anatomical lesion to explain the effusion. No case of acute effusion within the cranium should, however, be put into the last category, unless a careful and

complete post-mortem fails utterly to reveal a pathological lesion, and the diagnosis of acute essential dropsy during life is certainly a wholly impossible one. Practically acute intercranial effusion of serum is more frequently seen as the result of tubercular or simple leptomeningitis than from the other conditions above enumerated. (Acute hydrocephalus and tubercular meningitis are often used as synonymous terms, but, in view of the many other conditions which occasionally give rise to the former, it would be well to discontinue such use of these terms as misleading to students.)

Occasionally intracerebral hæmorrhage may result in the formation of a cystic accumulation of serum within the membranes of the brain or between them and the skull itself. Pachymeningitis may also cause a localized collection of serum. In such cases of localized cystic collections there is very apt to be marked pressure thereby of the subjacent convolutions. The amount of fluid present in any case of acute hydrocephalus is very small in comparison with the very large amount usually present in chronic hydrocephalus, and very rarely exceeds four or five ounces. When acute hydrocephalus arises from inflammatory disease of the membranes of the brain, the meningitis is commonly basilar. This is particularly true of the simple and tubercular meningitis of children, while cases occurring in adult life frequently involve the membranes over the convexity of the brain as well. Leptomeningitis as a cause of acute ventricular effusion is most frequent before the end of the sixth year, and more often arises in subjects debilitated by previous disease, or by poor hygienic and social conditions.

Pathology. — Post-mortem examination of the brain in acute hydrocephalus

of inflammatory origin reveals usually a basilar leptomeningitis, which may be simple, tubercular, infective, or syphilitic in origin, with an excess of fluid in the ventricles, causing a marked dilatation of them, while the substance of the hemispheres presents appearances due largely to the increased intracranial pressure. This intracranial tension often partly expels the blood from the vessels, especially during the last hours of life; so that at the post-mortem the brain-substance may look anæmic, especially over the vertex and throughout the substance of the hemispheres. In cases of simple leptomeningitis the naked-eye appearances of the pia at the base of the brain will rarely present marked evidences of the intense hyperæmia existing during life. The ventricles are distended with a slightly-opaque or turbid serum, while the choroid plexus is over-distended with blood, which may also be extravasated in punctiform patches in their immediate vicinity. The microscope shows extravasation of leucocytes along the lines of the blood-vessels and distending the perivascular sheaths, and also reveals minute capillary hæmorrhages, pus-cells, and in some cases compound granule-cells, depending largely upon the duration of the disease. The cerebral substance in some cases may contain areas of softening, but the rule is to find no such lesions, and, with the exception of changes in shape from pressure, the convolutions may be normal.

When tuberculosis is present it is usually also at the base in children, but may involve large areas of the pia mater in older subjects, and in adults the vertex is not infrequently the site of the tuberculous deposit. The characteristic post-mortem appearance is the tubercle, and the location in which this is most com-

monly found is in the pia overlying the crura cerebri, the optic, olfactory, and the point of exit of the third nerve, and also in the membrane as it extends over the corpora quadrigemini. The pia is much thickened, is covered by a grayish-white exudate, and the tubercles show as whitish-gray bodies imbedded in the membrane. In size the tubercles vary from exceedingly-minute bodies, hardly discernible macroscopically, to that of the head of a pin or even somewhat larger. The ventricles are distended with a turbid albuminous fluid, and there is thickening and softening of the ependyma. The microscope confirms the diagnosis and reveals the existence of numerous obstructions of the smaller arterioles from tubercular deposit, or an obliterating endarteritis. Giant cells may be seen in the perivascular spaces or in the cerebral substance, while the bacillus tuberculosis is seen along the lines of the vessels and in and around the areas of the tubercular deposits. In all cases the bronchial glands should also be examined, since they are frequently a most important factor in the production of the ventricular effusion.

Diagnosis.—The diagnosis of acute hydrocephalus is not difficult when it occurs as the result of meningitis. In such cases the prolonged coma, the irregular movements of the muscular system, with the respiratory rhythm, are all suggestions of the increased intracranial tension due to the ventricular effusion. The subacute cases are, perhaps, the most difficult of recognition, and the condition of the brain may remain unsuspected until the graver symptoms appear. The cases arising rather abruptly from the pressure of intracranial growths or from enlarged bronchial glands also present many difficulties in the way of early diagnosis, but the appearance of

grave signs of cerebral disturbance, the discovery in certain cases of other evidences of tuberculosis, or of retropharyngeal abscess causing embarrassment to the cerebral circulation, the exclusion of traumatism, the ophthalmoscopical examination, and a careful study of the history of the illness will often aid in making up an opinion. The very fatal cases which occur in large cities, especially during the course of the diarrhœal diseases of infants and young children, present few difficulties in their recognition, because the brain-symptoms develop so early and progress so rapidly toward death. In these cases the tendency toward a marked, but most deceptive, remission of symptoms should be borne in mind. In all cases of acute hydrocephalus the general wasting of the body is a prominent feature. In cases of long duration the emaciation may become extreme, and contractions occur in the limbs which may be more or less permanent should recovery take place. The characteristic hydrocephalic aspect is rarely seen in acute hydrocephalus, unless the case should drift into the chronic condition, cases of which are only rarely seen. Cases arising from meningeal hæmorrhage usually become chronic, the fluid being encysted between the membranes of the brain.

Prognosis.—The prognosis of acute hydrocephalus is always bad. The disease ends usually in death, or in permanent mental or physical defects, in the cases which escape death. Probably the syphilitic form is the most hopeful when the condition is suspected early enough to get the patient promptly under the influence of specific remedies. The cases arising from enterocolitis, or any of the acute fevers or other exhausting disease, offer little hope as to recovery, although occasionally a patient will recover. The

tuberculous cases are absolutely hopeless, although Jacobi and others have testified to the recovery of two or three cases. Subacute basilar meningitis may cause ventricular effusion and subside, leaving the effusion, which may remain stationary in amount or even lessen in amount so that the symptoms of its presence disappear; but usually the tendency is for it to increase, and finally, after months or years, the clinical picture of chronic hydrocephalus is produced, should the patient have been a young child, thus admitting of the expansion of the cranium.

Treatment.—The treatment of acute hydrocephalus is very often that of the primary disease to which the ventricular effusion is only secondary. Sometimes, from the very rapid progress of the case toward a fatal end, treatment can be of little avail. In the majority of cases it is almost hopeless, but in all cases every effort should be made, for occasionally the recovery of one of these cases from a seemingly-hopeless condition will amply repay the untiring care which they all demand.

When the initial symptoms of meningeal irritation appear, should the patient be seen at that early period, absolute rest in a darkened room, prompt vesication behind the ears with cantharidal colloidion, in children, and regular doses of calomel in great amount should be instituted. If necessary, opium should be given to control the restlessness, preferably combined with chloral, and these should be continued in suitable doses so long as the twitchings and spastic muscular condition continue. Irrigation of the bowels should be practiced where there is enterocolitis as the cause.

In all cases every part and organ of the body should be very carefully examined so as to exclude complicating con-

ditions and establish the diagnosis. The initial treatment is of the greatest importance, for after the effusion has occurred there is less hope of doing good.

When the patient is a sthenic subject and the arterial tension high, leeches or wet cups to the mastoid regions may be employed. After these measures the spinal ice-bag should be used in the cases with high temperature; and they should be avoided in those with low-temperature range, as collapse has been induced in such patients in my own experience. The bromides and chloral will usually be demanded to mitigate the tendency toward convulsions, while they both tend to lessen cerebral hyperæmia. Chloral may be used as a rectal injection in cases where the stomach is non-retentive. In some cases the warm bath is desirable and helps to calm the muscular system.

The diet should be carefully regulated and stimulants should not be given unless demanded by the condition of the pulse. In the later stages signs of collapse should be watched for, and that condition anticipated, when possible, by the prompt administration of a rapidly-acting stimulant, such as ammonia. Should the patient recover from the acute stage of the disease, diuretics, including the acetate and iodide of potassium, should be employed, with tonics, massage, and electricity, in order to increase the nourishment and activity of the muscles. Although the percentage of recoveries is exceedingly small, it is large enough to warrant the utmost zeal in the treatment of these distressing cases.

II. Chronic Hydrocephalus.

Definition.—Chronic hydrocephalus means a progressive accumulation of serum within the ventricles of the brain, or in rare cases external to the brain and

between its membranes, or between them and the skull itself; or in all of these situations. It is characterized by enlargement of the head, an almost pathognomonic facies, and by a progressive tendency toward death; often from gradual failure of the vital powers, or from intercurrent disease, or more rarely from rupture of the head.

Varieties.—The term *internal* hydrocephalus is used to denote the cases in which the effusion is ventricular, while *external* hydrocephalus is used to denote the cases in which the effusion is external to the brain. The former class of cases is by far the most numerous, and is meant when the word hydrocephalus is used alone. The disease may also be *primary* or *secondary*. Many of the cases are congenital, but in the majority of instances it is first noticed some weeks after birth.

Symptoms.—The symptoms of chronic internal hydrocephalus and the external variety of the same disease are similar and differ only in degree. External hydrocephalus is extremely rare, and is secondary, in the vast majority of the cases reported, to meningeal hæmorrhage and to pachymeningitis. It is also found in cerebral atrophy, probably as a compensating lesion, and also has been found in cases of congenital cerebral malformations. The amount of fluid found is very small in comparison with that found in internal hydrocephalus, but some cases have been reported in which the head was decidedly enlarged and the sutures separated.

Internal hydrocephalus, which is the ordinary variety met with in practice, presents as its chief symptom an enlargement of the head. In some cases this enlargement is very great, as in a case reported by Steiner, which exhibited a cranium $32\frac{3}{4}$ inches in circum-

ference at the eighth month. The normal circumference of the head at one year is given by Holt as from 18 to 19 inches. The increase in size of the head is usually in all directions, and the sutures in marked cases are widely separated, while the cranial bones are expanded and thinned out until sometimes they have a parchment-like sensation to the touch. The fontanelles are very large and bulging; the veins of the scalp are engorged; fluctuation of the head is quite common, and it may also be translucent to light. The scalp is stretched and thin and exhibits very little hair.

On the other hand, internal hydrocephalus may exist with no perceptible enlargement of the head and with perfect, and even premature, ossification of the cranial bones. Primary cases of internal hydrocephalus are most often congenital, but in most cases the condition is only recognized after some weeks subsequent to birth; but in other cases the condition develops rapidly *in utero*, and puncture of the head may be necessary to effect delivery. In the largest class of cases nothing is noticed until several weeks have elapsed after birth, when the abnormal size of the cranium attracts attention. The child is also noticed to have difficulty to support or move the head, or is incapable of supporting it at all. Soon drowsiness and apathy are apparent in the infant, and it sinks into a condition of hebetude with all the senses less acute than normal. There is apt, at this time, to be either undue flaccidity or stiffness of the extremities. The latter condition is more common and the thumbs are adducted with the fingers tightly closed. The pupils are usually contracted, but at times irregular or dilated. There is marked general emaciation. Convulsions may occur and be repeated, and slow rolling of the eyeballs

laterally or more or less strabismus may be features of the case.

The rapidity of the enlargement differs very much in different cases, and the clinical history depends largely upon this fact. In cases in which the increase of fluid is very slow the brain seems to accommodate itself to the pressure, and the symptoms of intracerebral pressure may be very few or almost entirely lacking until the case is far advanced. When chronic hydrocephalus is secondary, and arises after ossification of the cranial bones is firmly established, the symptoms of increased cerebral tension are earlier and more markedly seen, although the amount of fluid in the ventricles is relatively very small in comparison to the primary cases. A well-developed case of internal hydrocephalus presents quite a striking and characteristic appearance. The face is small and overshadowed by the enlarged cranium, the forehead is prominent and bulging, the eyes are directed down and formed so that the white of the eye is always more or less uncovered by the upper lids, the child is often restless, and there is frequently twitching of the extremities; a short, sharp cry is often given, and, taken in connection with the emaciated body, the picture presented is almost pathognomonic of the disease. The head is often rather flat behind, with bulging sides and greatly-rounded frontal regions.

Etiology.—Chronic hydrocephalus arises often, especially the congenital cases, without any demonstrable lesion of the brain. In many cases it is due to meningitis, or to other organic disease of the brain, such as tumor. Some authorities attribute a large proportion of the cases to syphilis, which certainly does appear often in the family histories.

Observations made upon 18 cases of hydrocephalus. Of these, 3 had well-

marked symptoms or signs of congenital syphilis. Among the remaining 15, 13 1/2 per cent. presented signs of enlarged liver and spleen, and which the writer believes were cases of hereditary syphilis, the result of an attenuated virus. It was noted that the apparently-healthy mothers of hydrocephalic children aborted more frequently than mothers who had borne healthy children. H. Elsner (*Jahrbuch. f. Kinderheilk.*, B. 43, H. 4).

Other authors ascribe the congenital defect to rickets, but this connection is not by any means clearly proved, for much confusion has arisen from the fact that, clinically, rickets and hydrocephalus have frequently been confounded, but they are sometimes associated. Primary hydrocephalus has also been causatively referred to tuberculosis, but there is lack of positive evidence. The influence of heredity is probably an important factor; often two or more children in the same family have been affected.

Extreme overwork and worry in the mother is, I believe, an important factor in determining the occurrence of primary hydrocephalus. It must be admitted, however, that we are still in the dark regarding the essential causative factor of primary hydrocephalus. In some cases of secondary hydrocephalus the cause can be clearly traced to an antecedent mild attack of basilar meningitis, or to a basal tumor, or to some mechanical cause producing venous stasis in the vessels supplying the ventricles.

Pathology.—The lesions found post-mortem are caused by the enormous dilatation of the ventricular cavities in which the effusion usually accumulates. Thus in very marked cases all the walls of the ventricles are extremely thin, the septum lucidum is obliterated, and sometimes the brain-substance forms a mere envelope for a large central cavity formed by the gradual expansion of the ventricles.

In more extreme cases nearly all of the brain-substance may have disappeared through the effect of the great pressure, and the brain resembles a cystic tumor, with only the basal ganglion and cerebellum and portions of the temporo-sphenoidal remaining, as in a case of Peterson's, referred to by Holt. The fluid found in cases of chronic hydrocephalus is slightly alkaline, translucent, specific gravity about 1005, and contains a trace of albumin and sometimes sugar. It also contains traces of alkaline chlorides and phosphates. The fluid in cases arising from meningitis is usually more turbid and contains a larger percentage of albumin. The quantity of fluid varies from a few ounces, in secondary cases, to six pints or more in primary cases.

Oppenheim (*Monats. f. Psych. u. Neurol.*, March, 1900) has described a case of myasthenia gravis pseudoparalytica in which he found bridging over of the aqueduct of Sylvius, and in some sections a third canal. Such anomalies of this region he believed had never previously been described. The occlusion in the case of H. C., reported by the writer, must, he believes, be of the same character as the partial occlusion in Oppenheim's case, and was probably congenital or acquired early, on account of the history of headache and vomiting dating from childhood. The occlusion must have become complete about six months before the patient's death, when the symptoms became much more intense than they had been previously. The closure of the aqueduct of Sylvius resembles in the changes of tissue produced by it the condition often seen in the region of the central canal of the spinal cord.

The symptoms were exceedingly suggestive of cerebellar tumor, and in every case where a tumor of this portion of the brain is suspected the possibility of internal hydrocephalus should be borne in mind.

This is by no means the first case in which the symptoms of brain tumor

were caused by internal hydrocephalus. Byrom Bramwell (Brain, Spring, 1899) some years ago reported cases in which the characteristic symptoms of cerebellar tumor were present, but a distension of the ventricles, apparently the result of closure of the foramen of Magendie from localized meningitis, was found. W. G. Spiller (Amer. Jour. Med. Sciences, July, 1902).

Excessive secretion of the cerebral meninges may occur in any form of animal life. The various forms of vegetable life are subject to excessive local or general secretion to a fatal degree. Hydrocephalus, ventricular or meningeal, may develop in utero or at any time throughout infant or adult life. The cases of spontaneous recovery are probably numerous, especially in infant life, in which the arachnoid is alone involved. All cavities may unite, with or without external rupture; when so, it is usually fatal, not necessarily instantly so. Spontaneous rupture may occur externally or subcutaneously, with an occasional recovery. The effusion may be into the lateral third or fifth ventricle, or it may be in the arachnoid or sub-arachnoid cavity, one or all.

A clot in the arachnoid cavity may cause a cyst which will enlarge, with all its consequences. Syphilis, tuberculosis, and rickets have been assigned as causes of hydrocephalus, but such have never been proved; the cause is yet unknown. Sometimes zones of new osseous material are scattered here and there in the meninges, and sometimes upon or in the brain substance. The septum lucidum is invariably thickened, as are the cerebral meninges in general.

Probably the greater number of cases of early hydrocephalus, whether of the third, fourth, fifth, or lateral ventricle, or of the arachnoid variety, can be cured by some form of drainage. Continuous drainage by seton or the repeated use of the trocar has given the best results in the way of benefit or cure.

Spinal drainage has been practiced in a very limited degree, and its value is as yet undetermined. Subcutaneous drainage has not resulted in a cure, but there seem to be many possibilities for

this method. Trephining for drainage is only resorted to in cases in which the fontanels have been closed by bony union.

Results from drainage are more favorable if done when the presence of fluid is first detected. It is sometimes necessary to drain both hemispheres, together with the right and left cerebellar cavity. The secret of curing arachnoid hydrocephalus by drainage probably lies in obliterating the arachnoid cavity. However, this can be done with hydrocephalus of the third, fourth, and fifth ventricular variety. The cardinal principle in this, as in all operations upon the brain, is asepsis. B. M. Ricketts (American Medicine, June 18, 1904).

The brain-substance is anæmic, often there is no line of demarkation between the gray and white matter, and the effects of pressure are evident in bad cases, which show, under the microscope, marked degeneration of the nerve-elements. In lesser grades of effusion the microscopical changes may be scarcely noticeable. The ependyma may be normal in appearance, but is often found thickened, infiltrated with leucocytes, and granular to the naked eye. In some cases it has undergone degenerative changes. In most cases some changes are found in the ependyma, and it is probable that these lesions are often directly responsible for the effusion itself, and that they result from an antecedent attack of ependymitis, simple or specific in character, and often occurring in fetal life.

The bones of the cranium are more or less widely separated, sometimes to the extent of three inches. More rarely premature ossification has occurred, and in these cases the head is not enlarged. The cranial bones are remarkably thinned, and may be almost as thin as paper. Spina bifida is quite frequently associated with hydrocephalus, and, less fre-

quently, some form of meningocele or encephalocele complicates the case.

Prognosis.—Complete recovery is practically unknown. In the most favorable cases the enlargement of the head spontaneously ceases after some years, and the patient may live for many years, but with no diminution in the size of the cranium. Mental defects are common in such cases. The majority of cases progress more or less rapidly to a fatal end. The rapid cases die within the first year, and it is very uncommon for a case of marked infantile hydrocephalus to live over the sixth year of life. Death usually results from marasmus, intercurrent disease, or from convulsions ending in coma from which the patient cannot be roused. Very rarely rupture of the head is a cause of death.

Diagnosis.—The diagnosis is usually an easy one. Chronic hydrocephalus must be distinguished from rickets and hypertrophy of the brain. No error is liable to occur in the very marked cases, but when the effusion is of moderate amount the diagnosis may demand careful examination. From hypertrophy of the brain hydrocephalus is separated by its more rapid development, the greater enlargement of the head, the fluctuation which is often present, the universal character of the expansion of the cranium, which is more marked at the vertex in hypertrophy of the brain, and by the almost pathognomonic facies of hydrocephalus, including the oblique direction of the eyes, with failure of the upper lid to completely cover the eyeball. To the touch hydrocephalus is softer and more compressible than hypertrophy.

Diagnosis of idiopathic internal hydrocephalus in the adult: great stress laid upon the variation in the intensity of the symptoms from day to day. These remissions and intermissions in the chronic cases must be largely relied upon

to distinguish them from cases of brain-tumor. Martin Prince (*Jour. Nerv. and Mental Dis.*, Aug., '97).

From rickets chronic hydrocephalus is distinguished by the rounded head, which in rickets is square or angular and often marked by nodules; also by palpation and the other signs of the hydrocephalic head above noted. In rickets, also, there will usually be other evidences of the disease in other parts of the body.

Cases of chronic external hydrocephalus may present more difficulties in diagnosis, but they are of very rare occurrence, and careful examination will usually separate them from the cases under consideration.

Treatment.—The treatment of chronic hydrocephalus by internal remedies only rarely results in any benefit. Probably the best diuretic and alterative in these cases is the iodide of potassium, which should be given a trial in cases where it is not especially contra-indicated.

In all cases of hydrocephalus congenital syphilis should be looked for, and, if found, antisyphilitic treatment should be adopted energetically and as early as possible. Heller (*Deutsche med. Woch.*, June 30, '92).

Case of child, 7 months old, suffering from chronic hydrocephalus. The head was enlarged, the fontanelles were wide open and bulging, and the veins of the face and scalp were dilated. The child was treated with potassium iodide internally (2 or 3 grains daily), and in five months all signs of chronic hydrocephalus had disappeared. J. Heller (*Deut. med. Woch.*, No. 5, '98).

Surgically, compression of the skull by adhesive plaster applied in strips has been tried, and cases of marked improvement have been reported as resulting from this treatment. The treatment much in vogue is a combination of pressure with adhesive strips covering in the entire vault and sides of the cranium,

combined with occasional aspiration of moderate amounts of fluid, followed by the reapplication of the adhesive plaster. The effects of the pressure must be carefully watched and the strips loosened or removed should dangerous symptoms appear. If syphilis is suspected mercurial inunctions to the head should be practiced.

Other modes of treatment are: incision with drainage, puncture by the trocar, blisters, and lumbar puncture. When any operative interference is considered, the preference of the writer is for repeated aspiration with strapping of the head.

Puncture of the skull favored in the treatment of hydrocephalus. The advantages are: 1. Cessation of convulsions. 2. Quieting of the restless, screaming patient. 3. Good influence on bodily development. 4. Improvement or saving of the physical functions. 5. Restoration of sight when lost. The disadvantages are: 1. Formation of an hæmatoma; very rare, and usually avoidable. 2. Infectious meningitis; avoidable by asepsis. 3. Meningitis through pressure; gangrene; occurs also without puncture, and is avoidable by drawing off small quantities at a time. 4. Collapse; never occurs in dangerous degree under favorable conditions. Wyss (Corres. f. Schweizer Aerzte, Apr. 15, '93).

Quinke's statements in regard to the comparative ease and safety of puncture and drainage of the spinal canal in hydrocephalus confirmed. In cases of high pressure a small fountain of cerebrospinal fluid flows from the cannula. The quantities of fluid drawn off vary between 1 and 3 ounces. The pulse is at first arrhythmic, but soon becomes steady again. It should be performed only under chloroform narcosis. Operated in twenty-two cases forty-one times without harm. Von Ziemssen (Centralb. f. d. Gesamte Therap., July, '93).

Of six cases, all tapped more than once, four improved and two almost recovered. The operation, if performed aseptically and the fluid drawn off slowly with the

head well depressed, is not attended with the danger usually ascribed to it; improvement usually follows the operation; and if done sufficiently early there is some prospect of the child becoming a useful member of society. Hern (Brit. Med. Jour., Nov. 11, '93).

Even when the fluid is allowed to flow out slowly, in order to avoid a too sudden evacuation, the death of the patient, often within twenty-four hours, is not prevented. Picqué (Le Bull. Méd., Oct. 28, '94).

Puncture regarded as not a dangerous procedure if carried out under antiseptic precautions, and if the fluid be evacuated in small quantities at intervals of several weeks. The employment of permanent drainage is more dangerous than evacuation of the fluid by puncture or even aspiration.

Puncture is indicated in those cases in which, in a previously healthy child, symptoms of hydrocephalus rapidly develop; if a progressive enlargement of the head be distinctly noticeable; if marked bodily or mental impairment be threatened. Raczyski (Oesterr-ungar. Centralb. f. d. Med. Wissen., No. 20, '95).

In a child of 10 months who developed internal hydrocephalus six weeks after symptoms of meningitis, the writer punctured the right lateral ventricle through the anterior fontanelle, which was still widely open. He withdrew by aspiration 40 cubic centimetres of fluid, and applied a supporting dressing, with decided improvement.

During the succeeding days there was some recurrence of the symptoms. The left lateral ventricle was then punctured and 70 cubic centimetres of fluid withdrawn. From this time the improvement in the patient was permanent. Grosz (Archiv f. Kinderh., xxvii, Nos. 3 and 4, 1900).

Case of chronic hydrocephalus in which a cure followed the systematic use of lumbar puncture, and a second in which slight, but persistent, improvement occurred. Whenever the pressure of the contained fluid was allowed to fall below 100 millimetres, marked temporal headache and even clonic convulsion resulted. The fluctuations in the level of the fluid

during crying or strong expiration could also be well observed. A. Grober (Münchener med. Woch., Feb. 20, 1900).

In regard to tapping in cases of hydrocephalus and introducing aseptic air, the provisional conclusions warranted by personal limited experience are few:—

1. With due precautions the fluid of chronic hydrocephalus may be completely evacuated from the yet unclosed skull of infants, and aseptic air may be allowed to take its place. This operation may be repeated without detriment and with scarcely more risk than belongs to the usual method of paracentesis.

2. In favorable cases attended with moderate effusion a single operation may suffice. Continued oozing from the puncture for a few days after the removal of the tubes is not unfavorable.

3. In cases of considerable effusion an obvious indication is to relieve the brain from the weight and from the pressure of the fluid. The evacuation is facilitated by the introduction of aseptic air. In a case witnessed this proved to be of decided advantage. By a timely repetition of the operation a hydrocephalic infant might be enabled to carry the weight of the head, and if the treatment were begun sufficiently early, permanent damage to the brain-tissue might be averted and a normal development might perhaps ensue.

4. In large heads, while hydrocephalus persists, a considerable splashing sound is readily obtained. There is obvious risk in eliciting this sound by forcible succussion, and for the same reason any abrupt movement of the head should be avoided. William Ewart and W. Lee Dickinson (Pædiatrics, Oct. 15, 1901).

Every effort should be used to increase the nutrition of the patient by codliver-oil, tonics, massage, and careful feeding, in the hope that the effusion may become self-limited and permit of life's being continued with more or less impairment of the mental and physical health.

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HYDROCHLORIC ACID.—Hydrochloric acid is a clear, colorless, pungent, fuming liquid having a strong acid odor and taste. It is miscible in all proportions with alcohol and water. It is incompatible with the alkalies and their carbonates, and with the salts of lime, lead, and silver.

Preparations and Doses.—Hydrochloric acid, 5 to 10 minims (diluted).

Hydrochloric acid, dilute (10 per cent. acid), 10 to 30 minims.

Physiological Action.—In common with other mineral acids, hydrochloric acid in its pure form is a decided caustic and escharotic. Its great affinity for water and its combination with the alkaline bases cause it to attack the living tissues energetically and induce destructive changes. Its caustic action is not as powerful or far-reaching as that of sulphuric or phosphoric acid. When ingested in a diluted form and in medicinal doses, its first action is to augment the salivary secretion. It is a general law that acids applied topically check the production of acid secretions from glands, while they increase the flow of alkaline secretions. Besides acting in this manner, the acid also acts through the cerebro-spinal nerves supplying the gland (Ringer). On reaching the stomach the acid combines with the alkaline bases present there and forms salts (hydrochlorates), which are usually soluble and somewhat irritating. Hydrochloric acid is normally present (0.2 per cent.) as an ingredient of the gastric juice; it aids the pepsin to digest and render soluble the albuminous and albuminoid food-principles, converting them into peptones. It also aids in the transformation of pepsinogen into pepsin.

Hydrochloric acid has a very high diffusive power and passes readily through animal membranes. Any portion of in-

gested acid which escapes union with the alkaline bases in the stomach diffuses rapidly into the blood and there forms salts with the bases of that fluid, setting free the weaker acids; this decreases the alkalinity of the blood and increases the acidity of the urine.

Action of combined hydrochloric acid on starch digestion. Conclusions: When a non-albuminous test-meal is given, free hydrochloric acid makes its appearance at the end of twenty minutes after eating, and at the end of half an hour the amount of free hydrochloric acid equals that of one or two hours after eating where albuminous foods are taken. Under normal conditions, the ptyalin of saliva digests most of the starchy constituents of food in the stomach within one or two hours, which takes place before free hydrochloric acid accumulates in the stomach to such an extent as to interfere temporarily with the diastasic action of saliva on starchy food. Those portions of starchy food which remain comparatively undissolved, and pass over to that portion of the digestive canal where they are acted upon by the pancreatic diastase, constitute a very small portion of the starchy food taken. The administration of isolated diastase considerably enhances the digestion of starchy food in the stomach, even under normal conditions. The elimination of the supply of the ptyalin of saliva to the stomach will cause marked retardation of starch digestion in the stomach. A maldigestion of starchy food, due to deficiency of the diastasic power of saliva, can be regulated by the administration of isolated diastase. The impression held by many that the diastase of saliva becomes non-active fifteen or twenty minutes after eating is totally erroneous. A. E. Austin (Boston Med. and Surg. Jour., Apr. 6, '99).

Poisoning by Hydrochloric Acid.—

Hydrochloric acid is an irritant and corrosive poison. When taken in a concentrated form it destroys the mucous membrane of the mouth, epiglottis, œsophagus, and stomach, and violent gastro-

enteritis attended with very alarming symptoms ensues. Pain is present throughout the digestive tract; vomiting of coffee-ground matter, blood, or even portions of the mucous membrane is associated with feeble pulse and clammy skin. Death occurs from collapse. Eschars are formed externally, and, although the acid leaves a yellow stain on clothing, it does not stain the skin. If the case is seen very early, the characteristic odor of the acid may be detected in the breath, and whitish pungent vapor may be seen issuing from the mouth.

Conclusions based on observations on cases of poisoning with hydrochloric acid: (1) it produces severe gastritis, with embryonic proliferation and extensive cellular necrobiosis; (2) there is great danger of penetration of the caustic liquid into the respiratory passages during efforts at vomiting; and (3) such efforts, therefore, should be prevented by washing out the stomach. Letulle and Vaquez (*Archives de Phys.*, Nos. 1, 2, '89).

Case of poisoning by hydrochloric acid in a woman, who drank 1 tablespoonful of pure muriatic acid. Besides burning and pain in the stomach, vomiting, diarrhœa, and cramps in the lower extremities, there were observed: (a) Absolute loss of tendinous reflexes on the first day of poisoning; this symptom disappeared on the second day; consciousness was complete. (b) Entire absence of injury of mucous membrane of the mouth. (c) Albuminuria, the sediments of the urine containing numerous hyaline and granular casts and purulent corpuscles. (d) One day's fever 102° F. on the sixth day of the disease, without any apparent cause. Lande (*N. Y. Med. Jour.*, June, '97).

On the ninth day following the ingestion of a poisonous quantity of hydrochloric acid, the mucous membrane of the œsophagus was expelled in a tubular form. Three months later death followed and an hypertrophy of the pylorus with a consequent stenosis was found. The prognosis is not always bad, as several recorded cases show. In this case,

in addition to the dense pyloric scar, there was a thickening of the entire musculature of the stomach. H. Strauss (Berliner klin. Wochen., Jan. 11, 1904).

Treatment of Poisoning by Hydrochloric Acid.—In these cases the use of the stomach-pump or stomach-tube is contra-indicated. The chemical antidotes are the alkalies and their carbonates, magnesia, lime (wall-scrapings, if nothing better), and soap-suds. The administration of albumin, eggs, milk, oils, etc., will act mechanically to protect and soothe the corroded tissues. Opium by mouth or by hypodermic injection is useful to relieve the pain and irritation. To counteract the great depression which these cases present, intravenous injections of ammonia may be made and nutrient and stimulant enemata given. If undiluted acid has been swallowed there is but little hope that the above remedies, or any other, will save the patient.

Therapeutics.—Hydrochloric acid is seldom used as a caustic, though its services may be marked for that purpose in sloughing gums of mercurial stomatitis, mucous patches, etc., if nothing better is at hand.

For cauterizing enlarged tonsils hydrochloric acid applied by a long capillary tube to the excretory ducts of the tonsils, three in each gland, at a sitting twice a week recommended. This is painless and produces no inflammation or swelling. Five or six applications are sufficient for moderately-enlarged tonsils. Kendal (Ann. of Ophthal. and Otol., '96).

Eight cases of sinuses leading to necrosed bone treated by the local use of hydrochloric acid. The acid employed was in the concentrated form, employed twice a week, the number of minims depending upon the individual case and the amount of bone exposed. The conclusions were as follow: 1. No evil effects have resulted from its use. 2. The use of the acid in its concentrated form is preferable. 3. When the area of necrosis is extensive operative methods

are advised. 4. Its action is limited to the necrosed area, whereas curetting may remove both diseased and healthy bone. 5. By the disintegration of the dead bone the newly-formed tissue has a better opportunity for its more rapid development. Waterman (N. Y. Med. Jour., Aug. 8, '96).

INTERNAL ADMINISTRATION.—The pure acid is never used internally, except when largely diluted. It is not stable, but must be kept in dark bottles, well stopped and in a cool place. The dilute acid may be given in beef-juice, in lemonade, or in syrup of lemon. When combined with the bitters, its efficiency is increased as a stomachic. In appropriate cases it may be combined with pepsin to increase the efficiency of the latter. It is most useful in gastric disorders and diseases consequent upon impaired digestion and assimilation.

GASTRIC DISORDERS.—In atonic dyspepsia, dilute hydrochloric acid may be given alone or combined with some preparation of pepsin, immediately *after* meals. Thus given, it is also useful when there is a deficiency of acid in the gastric juice, as in gastric cancer, a condition often made manifest by alkaline eructations.

In excessive acid formation, acid eructations, pyrosis, and ulcerative stomatitis it should be administered *before* meals. If the use of this remedy be too long continued the improvement which at first follows its use lessens and then ceases, and a train of symptoms arises which require an opposite plan of treatment: a catarrhal inflammation of the gastro-intestinal tract is induced, which is accompanied with diarrhoea, and perhaps wasting.

Weak solution of hydrochloric acid by internal administration recommended as remedy for nausea and vomiting. S. Alkiewicz (Nowiny Lekarske, Feb., '92).

Hydrochloric acid is capable of exercis-

ing a double action upon the digestion: an enpeptic action and an antiseptic action. As an enpeptic, it should be employed in all cases in which the digestive power is diminished and the amount of gastric juice is lessened. The following is the method of administration:—

R Hydrochloric acid, 15 minims.

Distilled water, 8 fluidounces.

M. Sig.: A wineglassful toward the end of each meal and one-half hour after.

Or

R Hydrochloric acid, 45 minims.

Distilled water, 9 $\frac{1}{2}$ fluidounces.

M. Sig.: A tablespoonful in half a glass of warm or cold water at the end of each meal.

The contra-indications to the employment of this drug are: all forms of hyperacidity and dyspepsias accompanied by hyperæsthesia. The treatment should not be continued for more than three weeks or a month, to be resumed, if necessary, after a remission of fifteen days. As an antiseptic it has produced good results in cases of fermentation with pyrosis due to the formation of organic acids, in dilatation of the stomach, etc. It should be given in these cases two or three hours after the meal. Huchard (*Jour. des Praticiens*; *Ther. Gaz.*, Aug., '95).

FEVERS.—The treatment of fevers by hydrochloric acid is an old and favorite one. The use of the acid increases the secretion of the salivary glands and of the mucous membranes of the mouth, relieving the dryness of the tongue and fauces; it makes good the deficiency of acid in the gastric juice, which deficiency is a characteristic of most febrile affections. In typhoid fever, alone, or, better, combined with pepsin, it restrains the diarrhœa, increases the digestive powers, relieves the dryness of the mouth and tongue and aids in preventing the accumulation and production of sordes. In scarlet fever and other eruptive fevers it relieves adynamia by improving digestion and assimilation.

PHTHISIS.—Associated with this dis-

ease there is usually a deficiency of the normal acid of the stomach and of the pepsin. Hydrochloric acid is useful in these cases, especially when the administration is stayed occasionally for a short time and then resumed.

URINARY DISORDERS.—When uric acid is present in the urine in excessive amounts as a result of faulty digestion and assimilation, the use of hydrochloric acid will cause a disappearance of the uric acid by improving the digestion.

CUTANEOUS DISORDERS.—In all skin affections which are symptomatic of impaired digestion and assimilation, the internal use of this acid is followed by good results. This explains the value of the remedy in certain cases of lepra, impetigo, acne, erythema nodosum, urticaria, etc. In very weak solutions it is a useful topical remedy against urticaria, profuse sweating, and torpid skin; for this purpose a general bath may be prepared ($\frac{1}{2}$ to 1 ounce to the gallon of water).

POISONING BY ALKALIES.—Hydrochloric acid diluted may be used as an antidote in cases of poisoning by the alkalies, but sulphuric acid, properly diluted, is preferable, as the salts formed by the former are usually soluble and somewhat irritating.

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HYDROCYANIC ACID.—Hydrocyanic acid, also known as cyanhydric or prussic acid, hydrogen cyanide, and formonitrile, is official in a 2-per-cent. solution (*acidum hydrocyanicum dilutum*, U. S. P.), which is a colorless liquid, having the odor and taste of bitter almonds. Dilute hydrocyanic acid is prone to decompose, becoming more or less brown in color, rendering it unfit for medicinal use; it should therefore be kept in a dark,

cork-stopped bottle, and dispensed with a pipette, rather than by pouring it. The metallic salts are generally incompatible; also the red acid of mercury and the sulphides; chlorine-water and all oxidizing agents change this acid into formalic acid.

Dose.—*Acidum hydrocyanicum dilutum* (2 per cent.), 1 to 15 minims.

Physiological Action.—Applied to the mucous membrane or the abraded skin, hydrocyanic acid rapidly diffuses into the blood. In medicinal doses it has a calmative effect. In larger doses it may cause nausea, faintness, giddiness, a feeble pulse, and great muscular weakness. Owing to its great diffusibility, its absorption is very rapid. It acts principally on the respiratory centre and the heart, and is eliminated very rapidly (one-half to one hour). If a larger quantity is taken it exercises a paralyzing effect upon every part of the body; the respiration, heart, brain, nervous system, and all the vital parts are paralyzed at once.

Poisoning by Hydrocyanic Acid.—

Prussic, or hydrocyanic, acid is one of the most rapid and violent poisons known. A single whiff of the pure acid will kill; it is therefore very unsafe to handle. When a large toxic dose is taken, death may occur in from two to five minutes. The usual symptoms are as follow: Sudden and complete insensibility, the eyes protrude with a glistening stare, the pupils are dilated and unaffected by light, the skin is cold and clammy, the extremities are relaxed and cold, the respiration is slow and convulsive, pulse feeble or imperceptible, and involuntary evacuations of urine, fæces, and semen. The odor on the body, the wide-staring eye, the clenched teeth covered with froth, and the livid cyanosed face are the diagnostic signs (Hare).

Series of experiments performed consisting in ejecting amygdalin and emulsin into the veins, so that on coming together they would form hydrocyanic acid. The changes which took place consisted in a slowing and final arrest of the respiratory movements, followed several minutes afterward by stoppage of the heart. These same results are reached even when artificial respiration is kept up from the first. Thirty minims of a 1 to 400 solution of hydrocyanic acid injected into the jugular vein of a dog weighing 38 pounds is sufficient to produce death by the methods named above. When the drug is given hypodermically to the frog the same phenomena occur, preceded by a complete loss of reflex activity. Gréhan (La Semaine Méd., Sept. 25, '89).

Absorption of hydrocyanic acid in the eye produces death from respiratory failure in from two to three minutes, by the passage of the poison into the blood. Gréhan (Brit. Med. Jour., Mar. 2, '91).

Results of forty-three observations upon various animals: Hydrocyanic acid stands foremost among agents likely to prove of antidotal value in chloroform poisoning. The best way to apply it is undoubtedly by means of a graduated drop-tube on the back of the tongue. The exact dose in the dog and cat averages about one minim of Scheele's acid for every seven or eight pounds of live body-weight. The object must be to give just enough acid to produce the preliminary excitant effect upon the respiratory centre. Frederick Hobday (Lancet, Jan. 1, '98).

Case of prussic-acid poisoning. The woman almost instantly fell to the floor, became unconscious, and had very severe tetanic convulsions. Her face became dusky, and she died in about twelve minutes. Autopsy one hour after death. Face slightly cyanosed; lips, mouth, and tongue slightly eroded; pupils widely dilated; mouth and nostrils frothy. Mucous membrane of the stomach and upper part of the small intestines bright red in color, swollen, intensely injected. Moderate engorgement of the brain, liver, kidneys, and spleen. The lungs were much engorged and oedematous, and

there were numerous subpleural ecchymoses. The blood was everywhere fluid, of a cherry-red color, and with a marked odor of prussic acid. Baker (Boston Med. and Surg. Jour., No. 19, '99).

Treatment of Poisoning by Hydrocyanic Acid.—In poisoning by hydrocyanic acid the most useful remedies are cold affusion to the head and spine; ammonia by inhalation, by mouth, and by intravenous injection; artificial respiration, atropine, and heart-stimulants. If seen early, evacuation of the stomach by emetics or irrigation may be useful, the addition of peroxide of hydrogen to the irrigating fluid being capable of transforming any prussic acid present into oxamide, which is relatively harmless.

Therapeutics.—Hydrocyanic acid is used principally to allay pain and spasms when taken internally. When applied externally it allays itching.

SPASMODIC DISORDERS.—Hydrocyanic acid is useful in functional disorders of the pneumogastric nerve. In various forms of nervous vomiting, the vomiting of pregnancy, the reflex vomiting of phthisis, and that which accompanies some cerebral diseases, Bartholow suggests the following mixture:—

℞ Acidi hydrocyan. dil., 1 drachm.
Aquæ laurocerasi, 2 ounces.

M. Sig.: A teaspoonful every two to four hours.

Nervous cough is often promptly relieved by 2 or 3 drops of dilute hydrocyanic acid in a teaspoonful of wild-cherry syrup.

GASTRIC DISORDERS.—Nervous gastralgia is quickly cured by this remedy. Nervous and irritative dyspepsia and enteralgia are promptly relieved.

CUTANEOUS DISORDERS.—Prussic acid affords relief in many skin affections in which itching is a characteristic symptom. Fox suggests the following for-

mula in pruritus, lichen, and in the syphilodermata:—

℞ Hydrargyri bichloridi, 1 grain.
Acidi hydrocyanici dil., 1 drachm.
Emulsi amygdalæ, 6 ounces.

M. Sig.: Apply externally.

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HYDROGEN DIOXIDE.—Hydrogen dioxide, peroxide; peroxide of hydrogen; or oxygenated water in a pure, undiluted state, is a syrupy liquid of unstable composition. It readily decomposes into oxygen and water. It is rarely met with in its pure state.

For medicinal and surgical uses a diluted solution is official; it deteriorates by exposure to heat, sunlight, or prolonged shaking. It is, however, the most stable solution that has been prepared.

Preparation and Dose.—Aqua hydrogenii dioxidi (3 per cent. or 10 vol., U. S. P.), 30 to 120 minims.

Physiological Action.—The official solution has a slightly acid taste, owing to the presence of a small amount of acid added as a preservative. Taken into the mouth it foams and produces a slight pungent, stinging sensation. Its properties are those of an antiseptic, deodorant, and styptic. Its effects are produced by the liberation of oxygen and by consequent oxidation. Taken internally, hydrogen dioxide is not poisonous.

The possibility suggested that the peroxide contains impurities of an irritating nature, these impurities being the salts and acids used in the production of the remedy in question, and which in themselves must be poisonous. Blackader (Boston Med. and Surg. Jour., May 19, '92).

At ordinary temperatures and with ordinary agitation hydrogen dioxide is practically decomposed in eight weeks. Pressure exerts no restraining influence in this change. Boroglycerin, added in

proportion of 1 per cent., retards decomposition, but does not prevent it. **Ex-**temporaneous preparation of hydrogen dioxide as required is recommended. Squibb (*Ephemeris*, Jan., '94).

This apparently innocent substance is not always free from dangerous effects. The "explosive" manner to which the gas is sometimes given may distend and rupture tissues and carry infection into the cellular tissues for a considerable distance. Case of mammary carcinoma in which the injection of a small sinus with the peroxide of hydrogen resulted in opening up and carrying infection into the axilla. G. W. Spencer (*Ther. Gaz.*, July 15, '99).

Therapeutics.—Hydrogen is an active destroyer of false membranes, pus, and pathogenic germs. It is sometimes used as a diagnostic means for the detection of pus, since contact with pus causes a foaming and frothing until all traces of pus have disappeared. It is also used in dressing wounds, etc.

Puttmann and Liebreich consider the internal use of peroxide of hydrogen dangerous and useless. For its use, in cases of hyperemesis gravidarum, good results have been claimed. Barous claims that folded sheets steeped in peroxide of hydrogen and hung up in the sick-room will cut short the course of whooping-cough. The author considers that this simple remedy deserves a trial. Some of the ill effects of the drug are ascribed to the fact that the preparation usually sold is chemically impure, and not concentrated enough. Von Bruns has had a preparation made which is ten times as strong as the ordinary commercial preparation, and which is chemically pure. This preparation is said to have been used with very good results in infected wounds. It is also used in ophthalmic practice, for corneal abscess with hypopyon, for iris hæmorrhage, and as a hæmostatic in cataract operations. It is further said to be of service in bad-smelling otitis media (otorrhœa) and purulent rhinitis, and in endometritis. For the last named, a wool packing, soaked in per-

oxide, is supposed to be able to take the place of curetting. Lewitt (*Deutsche med. Wochen.*, May 16, 1901).

DIPHTHERIA.—Hydrogen dioxide is one of the most valuable applications for the destruction and removal of false membrane, and this without danger of poison or of irritation. On contact with the false membrane an active effervescence ensues, and the membrane comes away in pieces or shreds. It is best applied in spray form, using a rubber or glass-tipped atomizer on account of the oxidizing influence upon metal spray-tubes. It may also be applied by means of a swab or a glass syringe.

Hydrogen peroxide in a number of cases of diphtheria produced appearances which might have been mistaken for the original disease, but which readily disappeared on withdrawing the peroxide. The disease had not only not been benefited, but had been prolonged by the use of the drug. Jacobi (*Boston Med. and Surg. Jour.*, May 19, '92).

Fifteen-volume solution of peroxide of hydrogen used in the form of a spray in the mouth and nose in diphtheria without any bad results. It seemed for a time to lessen the membrane, but the latter quickly returned. Buckingham (*Boston Med. and Surg. Jour.*, May 19, '92).

Case in which, thirty-six hours after using the peroxide of hydrogen in weak solution as a spray and gargle, a whitish veil appeared in the mouth, and then beginning ulceration and a pseudomembrane over these ulcerated spots. The peroxide was stopped and the patient recovered. Caillé (*Boston Med. and Surg. Jour.*, May 19, '92).

PURULENT AFFECTIONS.—The application of hydrogen dioxide to pus-secreting surfaces and cavities is followed by the most satisfactory effects. Whenever this agent meets pus, active effervescence ensues, germs and pus are disintegrated, and the part is rendered aseptic without any fear of poison. For this purpose its use is quite extensive. Abscess-cavities,

unhealthy suppurating surfaces, chancre, chancres, bed-sores, gangrenous wounds, ulcers, necrosis, cancerous wounds, etc., are all amenable to the beneficial action of this agent. Diluted with 4 to 8 parts of water it may be used with good results as an injection for gonorrhœa and leucorrhœa. Suppuration in post-operative wounds is checked and healing promoted by spraying the parts with hydrogen dioxide before applying the dressings.

Hydrogen peroxide has proved most successful in the treatment of tubercular abscesses and sores of all kinds. It is superior to anything employed in keeping drainage-tubes and deep cavities clean and sweet. T. S. K. Morton (*Med. News*, Dec. 28, '89).

Peroxide of hydrogen is successfully used in abscess of the brain, and in many other cases where suppuration is the chief feature. In affections of the eye, nose, and urethra its use may be preceded by cocaine or ether to prevent smarting. In old sinuses its employment to be followed with balsam of Peru, which encourages granulation. Diphtheritic membranes are easily removed by it. Wherever there is pus peroxide of hydrogen should be used. The substance should not come in contact with metals, nor with the hair, as it bleaches the latter. A solution kept tightly corked in a cool place remains active for many months. R. T. Morris (*Med. News*, Dec. 28, '89).

Hydrogen peroxide is not an unstable preparation if kept in a dark and cool place. It is an excellent antiseptic and disinfectant, and especially valuable in herpes progenitalis, soft chancres, and gonorrhœa. This latter disease is cured by the remedy, in injections, in from eight to twenty-four hours. Manassein (*St. Louis Med. and Surg. Jour.*, Jan., '90).

Hydrogen peroxide found of great use in fungous ulcers and cold abscesses, possessing, in the proportion of 1 to 100, an energetic disinfecting power. A solution in nutritive substance of 1 to 352

not only impedes the development, but after some days kills the spores of the bacillus of charbon. Its action is stronger against the charbon bacilli than is the bichloride of mercury. N. Pane (*Annali dell' Istituto d'Igiene Sperimentale dell' Università di Roma*, '90).

In 40 cases in which hydrogen peroxide was used as good results were produced as by the bichloride of mercury, and in some cases better. Buck (*Times and Register*, Jan. 3, '91).

It may be used in cases where a complete opening of a fistula or abscess is impossible. Here irrigation with the peroxide has an excellent action. If, then, an antiseptic bandage be applied, healing takes place very rapidly. If, in cachectic patients, the granulations are weak and slow in growth, one may alternate with injections of equal parts of ether and balsam of Peru. This procedure is of great value in suppurating cavities with indurated edges. Where the drug is injected into cavities, one must see that there is free exit for the gas which quickly forms. Graff (*Med. Neuigkeiten für prak. Aerzte*, No. 2, '92).

Peroxide of hydrogen valued in the treatment of exposed wounds, on the ground that it forestalls suppuration and promotes cicatrization. Application of a 15-volume solution to the nasal membrane and the mucous membrane of the cervix uteri recommended to remove adherent mucus for the purpose of medication. C. M. Fenn (*Ther. Gaz.*, Mar., '92).

Menthoxol, camphoroxol, and naphthoxol consist of a 3-per-cent. solution of peroxide of hydrogen, to which a quantity of alcohol and 1 per cent. of menthol, or 1 per cent. of camphor, or 2 per cent. of naphthol, respectively, have been added. They destroy the spores of anthrax within three hours and in a 10-per-cent. solution within six hours. These preparations were used in about two hundred cases of phlegmon, abscess, ulcers, and granulating wounds, sterilized gauze wetted with a 10-per-cent. solution being applied to the part with the usual cotton-wool dressing

above it. The dressings were renewed, as a rule, every second day. As soon as the compound came into contact with the secretion of the wounds there was a considerable development of gas. In phlegmonous cases the necrosed tissue very soon came away, the secretion diminished, and healthy granulations appeared. Ulcers of the legs healed better under these dressings than under any other treatment. The three compounds did not show any difference in their action. They have an agreeable odor, and are therefore very useful in fetid sores or abscesses. No undesirable effect has hitherto been observed. Wagner (*Deutsche med. Woch.*; *Lancet*, Jan. 1, '98).

AURAL DISORDERS.—The suppuration of middle-ear disease is lessened and the odor removed by the use of hydrogen dioxide. Impacted cerumen may be disintegrated by instilling a few drops of the solution into the ear. Violent effervescence ensues, the cerumen is disintegrated, and removal by warm water and syringe rendered easy.

Used with success in 22 cases of suppuration of the middle ear. In ozæna and rhinitis it is used in 10-per-cent. strength. F. W. Frankhauser (*Times and Register*, Aug. 15, '91).

INSECT-BITES.—The application of this remedy counteracts the pain and poison of the bites and stings of insects, bees, wasps, and hornets.

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HYDRONEPHROSIS.—Gr. *ὕδωρ*, water, and *νεφρός*, a kidney.

Definition.—A collection of urine in the pelvis and calyces of the kidney due to obstruction.

Varieties.—In addition to the usual or more or less typical form, two subvarieties are distinguishable: (a) the intermittent and (b) hydronephrosis paraplegica. In the latter type paraplegia

develops as a complication, and beyond the mention of this fact it scarcely deserves a separate clinical description.

Symptoms.—The clinical symptoms are somewhat dependent upon the cause and stage of development of the hydronephrosis. When, as generally happens, the condition is unilateral, it often escapes notice, since the symptoms are slight or even wanting, until a tumor is discoverable. The ureter on the opposite side may become obstructed, followed by uræmic manifestations, the latter occurrence first inviting attention to the condition. In the bilateral form, the uræmic symptoms are apt to supervene easily. The flow of the urinary fluid may be noticeably diminished, though subject to variations. The patient may complain of frequent and acute pains that shoot about the affected loin-space and downward toward the thigh. Abnormal sensations of weight and a dragging discomfort, at times amounting to a dull, aching pain, are quite common. The latter symptom, particularly in large hydronephrotic tumors, may be continuous and distressing; less frequently the cyst is painless. The tumor may cause obstinate constipation from pressure of the colon; or it may, if moderate in size, provoke diarrhœa, from the pressure-irritation. Resulting from the same cause are flatulency and irregular bowel-action. Among gastric symptoms, anorexia is the most common, while nausea and vomiting are sometimes associated. Hæmaturia may be present, but is rare and usually occurs with attacks of pain. Slight albuminuria may be present. The urine is of low specific gravity; the urea is diminished, and the phosphates are greatly reduced in most instances. Renal casts are absent, as a rule, unless chronic nephritis co-exists as a complication.

In all except the earliest stages there

is easily detectable a swelling in the region of the affected kidney. It increases in size in a slow and gradual manner, and there is great dilatation of the pelvis of the kidney. Visible bulging usually occurs in the hypochondriac and lumbar regions.

On palpation, a rounded, firm, more or less elastic and sometimes fluctuating tumor is detected. The enlargement may be slightly tender. I would advise energetically that when the tumor is of moderate size it is most readily felt when the abdominal position is employed, examining bimanually. Percussion elicits dullness over the mass, except in cases in which the colon overlies it, when the note is tympanitic: a characteristic sign of renal tumors. Moderate enlargements generally do not descend during inspiration, though exceptions to this rule rarely occur.

INTERMITTENT FORM (LANDAU). In this variety decided variations in the size of the tumors occur: *i.e.*, coincident with a more or less sudden increase in the quantity of urine passed (polyuria) the tumor quickly diminishes. On the other hand, the enlargement gradually increases from retention as the flow of urine decreases. The principal cause of hydronephrosis is a movable kidney, and hence the affection occurs mostly in women that have borne children. According to Albarran, the polyuria which commonly follows the attacks of pain in movable kidney is due to excessive urinary secretion, and not to a flow of urine which has previously been retained in the pelvis of the kidney. He reports a number of cases in which an operation for movable kidney, in patients suffering from intermittent hydronephrosis, was performed by himself, and total absence of dilatation of the pelvis of the kidney was noted.

Preceding and accompanying the polyuria in these cases are colicky pains, and hæmaturia is not uncommon. For obvious reasons, the tumor in intermittent hydronephrosis displays considerable mobility. The general features consist merely of a certain loss of flesh and strength incident to the associated worry and anxiety. The filling of the nephrydrotic cyst, the enlargement, and the pain of subsequent discharge, with marked diminution of the tumor, recur with variable frequency. Among the causes that are apt to produce a kinking of the ureter, and thus excite an attack, are violent physical exertion; jarring or jolting, as in riding or driving; or acute gastro-intestinal derangement, and strong mental emotions. The duration of the attacks varies from several hours to a day, though the cyst may continue to increase in size for several days after the pain has disappeared. During the intervals, and even while the greatly increased flow of urine is present, the patient feels tolerably comfortable.

The occurrence of chills, fevers and sweats, rapid pulse, nausea and vomiting, and abdominal distension is indicative of suppuration, and the appearance of the common sequel—pyonephrosis. This is confirmed by the cloudy urine, revealing pus, following both discharge and aspiration. Chronic nephritis may supervene, as shown by the lower specific gravity and the presence of albumin and casts in the urine. The arterial tension will then be increased, as a rule. Among other sequelæ may be mentioned acute febrile or chronic afebrile uræmia, the latter having been mentioned above.

Differential Diagnosis.—(a) Pyonephrosis may be eliminated in the absence of an abundance of pus-cells in the aspirated fluid and of the general symptoms of suppuration.

ECHINOCOCCIC CYST.—In this disorder there is a history of close association with dogs; the size of the tumor constant and slowly increasing; urea is not demonstrable in aspirated fluid. In fluid removed by puncture the echino-

distinguished by exclusion from *ovarian cyst*, *cystic kidney*, and *tumors of the spleen, liver, and gall-bladder*. It is sometimes necessary to detect the tympanitic band, to evacuate the colon by the introduction of air, and this, coupled with a chemical examination of the fluid obtained on exploratory puncture, will suffice in most cases. With reference to ovarian cyst, it is to be recollected that a slight amount of urea is sometimes found.

Etiology.—The principal factor in the production of dilatation of the pelvis of the kidney is chronic or prolonged obstruction, caused by occlusion of the ureter, either congenital or acquired. Probably from 20 to 35 per cent. of the cases are congenital (Roberts). The former cases are due to obstruction induced by a defective development or malformation of the ureter of one or both sides, usually the latter.

An instance of hydronephrosis, occurring in a young man, in which there seems to be a congenital factor of causation. The tumor apparently followed a fall, but when the patient was but a day or two old the father had had occasion to call the attention of the physician to the enormous size of his abdomen, and this had never entirely disappeared. The tumor at the present time was of enormous size, filling up the whole right side of the abdomen, the hypogastrium, and a part of the left iliac fossa. Lannois (Lyon Méd., Nov. 30, '90).

In many cases hydronephrosis develops during intra-uterine life. The specimen illustrated in Fig. 1 was obtained from an infant which survived its birth a few days. Only one kidney was present. Dissection clearly indicated that mechanical obstruction of some kind interfered with the flow of urine through the vesical orifice of the ureter. In Fig. 2 is shown an example of narrow ureter, acting as cause. Bland Sutton (Clin. Jour., July, '97).

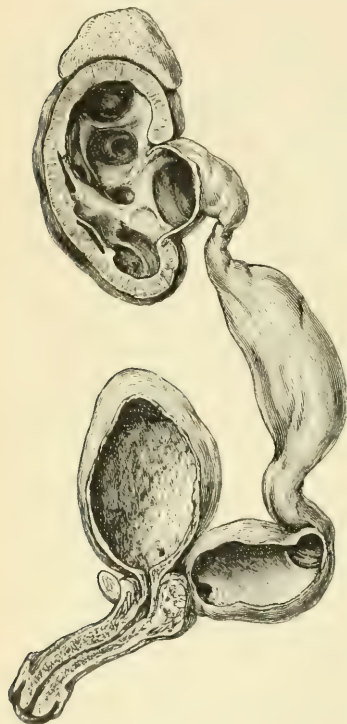


Fig. 1.—Urinary organs of a newborn child, showing mechanical obstruction. (Bland Sutton.)

coccus-hooklets, shreds of membrane, and sodium chloride are found. A movable kidney is not detectable. The urine is constant in amount. Recurrences do not occur.

Additionally, hydronephrosis must be

There may be atresia, a valve-like formation, or an acute (oblique) insertion of the ureter into the kidney.

Apart from hydronephrosis caused by renal calculi, the most common form of obstruction capable of determining hydronephrosis is a valve-like projection which occludes the upper end of the pelvis of the kidney or one of its divisions. Fenger (*Annals of Surg.*, June, '96).

Case of a boy, aged 12 years who developed a hydronephrosis from a kick by a horse. Nephrotomy and thorough drainage, after the removal of a mass of fibrinous and clotted substance from the hydronephrotic cavity, was followed by complete recovery. The cause was undoubtedly clogging of the ureteral orifice by blood clots which had accumulated within the pelvis of the kidney after the injury. This form of hydronephrosis is very rare. Riáboff (*Roussky Vrach*, July 26, 1903).

Excessive dilatation has occasioned more or less mechanical difficulty during labor. The causes, both predisposing and exciting, of the acquired cases are varied, and may be conveniently grouped in tabular form as follows: 1. Sex, women being more often subject to hydronephrosis than men, especially those having borne children. 2. Age; apart from the congenital cases, hydronephrosis is most common in middle and advanced life. 3. Impacted calculi in the ureter or renal pelvis. 4. Disease of the ureteral walls, as inflammatory thickening and cicatricial stenosis from ulcers. 5. Flexion and twisting of the ureter, as from movable kidney.

The usual cause for intermittent hydronephrosis is a floating kidney which, when displaced, causes a kink in the ureter, thus arresting the evacuation of urine until the organ slips back into place again. Most of these cases of intermittent hydronephrosis eventually become permanent, owing to inflammatory changes which often result in bands of adhesions, thus fastening the kidney

in its displaced position. Terrier and Baudouin (*Revue de Chir.*, Sept., Oct., Dec., '91).

Hydronephrosis produced in the dog, four out of eight times, simply by separating the kidney from its attachments. Tuffier (*La Semaine Méd.*, Dec. 1, '93).

Simple hydronephrosis considered as due, in many instances, to an inherited tendency, often associated with more or less malposition or mobility of the kidney. Cramer (*Centralb. f. Chir.*, Nov. 24, '94).

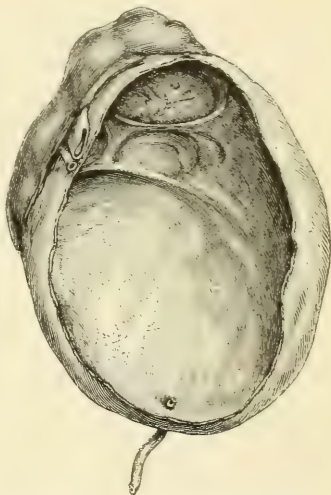


Fig. 2.—Large intermitting hydronephrosis due to an inadequate ureter. (Bland Sutton.)

6. Pressure upon the ureter from without, as by tumors and constricting bands (pelvic adhesions). The gravid and retrodisplaced uterus, uterine and ovarian neoplasms, and similar conditions causing compression or traction and obliteration of the lumen of the ureter, are found in this class.

Case of cancer of the uterus which caused complete obliteration of the left ureter and almost complete obliteration

of the right. The ureter was moderately and the pelvis enormously dilated, the latter forming a large pocket; the kidney itself appeared to be but slightly involved. On the left side, where there was complete obstruction of the ureter, there was almost no hydronephrosis. *Frumussaine* (*Bull. de la Soc. Anat.*, No. 10, '93).

Aberrant renal vessels considered as a cause of hydronephrosis, as seen in four cases. In two of these veins and in the other two arterial branches were the aberrant vessels. *N. Pitt* (*Brit. Med. Jour.*, Apr. 21, '94).

Hydronephrotic kidney in which the obstructive cause was a small branch of the renal artery, which crossed the ureter a short distance from the insertion of the latter into the pelvis, causing an angle in the course of the ureter and producing obstruction. *Coats* (*Glasgow Med. Jour.*, May, '94).

7. Diseases and tumors of the bladder that involve the ureteral orifices, particularly carcinoma, or that cause retention, as prostatic enlargement. 8. Urethral structure.

Traumatic hydronephrosis may be due (1) to serious injury, with rupture and consecutive stricture of the ureter; (2) to an extravasation of blood about the kidney and ureter; (3) to a blood-clot obstructing the ureter; (4) to displacement, by the traumatism, of a calculus, which lodges in the ureter; (5) to displacement of the kidney and closure of the ureter. *P. Wagner* (*Schmidt's Jahrbücher*, Apr., '94).

Pathology.—The cyst caused by a dilatation of the pelvis of the kidney, often assuming the shape of the latter, may become very large, containing as much as several gallons of fluid. The external appearance of the walls may be lobulated, particularly in medium-sized sacs; the interior, however, shows only partial septa projecting from the walls into the cavity of the sac, as a rule. According to the site of the obstruction one or both ureters may also be dilated, and if, as is usual, one kidney is involved, its

fellow is often hypertrophied. Marked enlargements cause displacement of the adjacent abdominal organs.

Atrophy of the renal tissues results and is proportionate to the size of the tumor or dilatation. Accumulated liquid causes flattening and atrophy of the papillæ and gradually of the tubules and glomeruli, and in extreme cases remnants only of the renal structure remain in the walls of the hydronephrotic cyst. In the renal parenchyma (medullary and cortical) there is a growth of connective tissue, a chronic nephritis with degeneration and atrophy of the renal cells. The mucous membranes lining the pelvis and calyces first become thinned, and later thickened, by the growth of connective tissue, thus forming a dense sac-wall.

If hydronephrosis is complete,—that is, if the urethral outlet is wholly impervious,—only a moderate dilatation of the kidney occurs, since atrophy of the nephritic tissue, under such circumstances, speedily ensues, thus putting an end to the secreting process. If, however, the hydronephrosis is incomplete, great dilatation eventually takes place, since in the latter condition hypertrophy rather than atrophy of the parenchyma is the rule. *Albarran and Legueu* (*La Semaine Méd.*, Apr. 30, '92).

The cause of intermittent hydronephrosis is a congenital predisposition of the pelvis of the kidney and of the ureter to hydronephrosis. The pelvis of the kidney is large, horizontal, crooked, or like a bag-pipe in shape, and there are strictures, folds, or torsions at the upper end of the ureter. The condition may follow movable kidney, but is more often the cause of a floating kidney. The condition may become permanent, either from the beginning or after frequent recurrence, due to adhesions which prevent the evacuation of the cyst contents. *P. Bazy* (*Revue de Chirurgie*, Jan., 1903).

The fluid contained in the sac is usually a clear, thin, yellowish, watery urine. Its composition, however, varies.

The specific gravity is low, and the reaction is often slightly alkaline. Traces of albumin, urea, and uric acid are found, although in long-standing cases the latter two ingredients may be absent. Turbidity may be observed, owed to admixture with pus, blood, or epithelium, but only in instances in which previous inflammatory conditions—as a calculous pyelitis—or local complications—as hæmorrhage, suppurative inflammation, and the like—have existed.

Prognosis.—In unilateral hydronephrosis, the more common variety, the prognosis is guardedly favorable, on account of the establishment of compensatory function on the part of the unaffected kidney, and this is particularly true if the case be one of movable kidney. The bilateral affection is always grave, having about the same outlook as chronic pyonephrosis. Among dangerous accidents and complications may be mentioned uræmia, rupture of the sac, and infection of the cyst by pus-organisms. Recovery may ensue in rare instances in which a spontaneous discharge of the fluid occurs.

Treatment.—The congenital form, when bilateral, is not amenable to treatment. It is rarely feasible to force the fluid out by manipulation of the tumor. This method tends to remove the occlusion, when caused by a slight twist or kink in the ureter. In unilateral hydronephrosis, carefully tapping the cyst may be practiced, thus overcoming the mechanical discomfort. Operative interference, with a view to removing the special obstructive cause, is also to be encouraged and advised in suitable cases.

In acquired hydronephrosis symptomatic treatment only is required in moderate enlargements, though sometimes gentle massage over the sac, properly directed and cautiously applied (to

avoid rupture), may cause a reduction in the size of the cyst. In the majority of instances surgical measures only are of use. Repeated aspiration of the sac has in a few reported cases accomplished a cure. Surgical measures also embrace nephrotomy and drainage, nephrorrhaphy (particularly when caused by movable kidney), and nephrectomy.

Nephrectomy advocated for hydronephrosis. J. Bland Sutton (Clinical Jour., Nov. 15, '93).

Case of intermittent hydronephrosis in a child successfully treated by operation. All that was discovered was a movable kidney. This was tethered, and in a few weeks the patient was entirely free from the previous trouble. The cure proved to be permanent. Setske (Australasian Med. Jour., Apr. 20, '99).

Treatment of hydronephrosis is due to renal displacement as follows: Nothing can be more rational than the employment of some means to prevent renal displacement. Various bandages with repeated modifications have been used for this purpose, with little success. Nephrorrhaphy is the remedy *par excellence*. In a number of cases the author has been surprised by the absolutely permanent relief of the suffering from this condition in which nephrorrhaphy has been done. Bovée (Medical News, May 9, 1903).

In no cases in which the symptoms are mild should surgical procedures be undertaken, as in some instances of the intermittent variety.

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HYDROPERICARDIUM. See PERICARDIUM, DISEASES OF.

HYDROPHOBIA. See RABIES.

HYOSCYAMUS AND HYOSCINE.—Hyoscyamus (U. S. P.) is the leaves and flowering tops of *Hyoscyamus niger*, or henbane, which is indigenous to the United States. The plant is an annual

and belongs to the family of *Solanaceæ*. The fresh herb has a rank, heavy, sickening, unpleasant odor, which disappears on drying. The plant contains hyoscyamine, an active principle (alkaloid), which occurs as white, silky crystals, and also in an amorphous form, as a brown, syrupy liquid. From the latter Ladenburg derived a new hyoscyamine. He found that hyoscyne, hyoscyamine, and atropine were isomeric, having the same formula, and each being separable into tropic acid and tropine, or pseudotropine. Both hyoscyamine and hyoscyne form salts with the acids.

Preparation and Doses.—Hyoscyamus, 5 to 15 grains.

Extract of hyoscyamus, 1 to 3 grains.

Extract of hyoscyamus, fluid, 3 to 10 minims.

Tincture of hyoscyamus, 10 to 60 minims.

Hydrobromate of hyoscyne, $\frac{1}{200}$ to $\frac{1}{100}$ grain.

Hydrobromate of hyoscyamine, $\frac{1}{130}$ to $\frac{1}{60}$ grain.

Sulphate of hyoscyamine, $\frac{1}{64}$ to $\frac{1}{32}$ grain.

Physiological Action.—Its action on man is analogous to that of belladonna and stramonium, though milder. Children can be given a larger dose than adults. Hyoscyamine, according to Gnauck and other observers, resembles atropine in its action upon the vagus and heart-muscle, though its effects are less marked and prolonged. It seems also to exercise an inhibitory influence upon the vasomotors, especially those of the abdominal vessels. It is an active soporific.

Study of the physiological action of hyoscyne hydrochlorate upon cold- and warm-blooded animals. Upon the first, minute doses (less than $\frac{1}{64}$ grain) slow the action of the heart by stimulating the peripheral cardio-inhibitory appa-

ratus. Larger doses accelerate cardiac action, increase muscular contractility, irritability of spinal cord, and conducting power of motor nerves; they also slightly depress the excitability of peripheral sensory nerves. Still larger doses intensify these symptoms, lowering reflex action. Toxic amounts produce diastolic arrest of heart, loss of reflexes and of function of both sensory and motor nerves, and finally cerebral paralysis. On warm-blood animals, as dogs and rabbits, hyoscyne at first diminishes and afterward increases the cardiac beats by a primary stimulation and a secondary paralysis of the peripheral cardio-inhibitory apparatus. Subsequently the drug diminishes the pulse by depressing the excitomotor apparatuses of the heart. The pressure is increased through stimulation of spinal and vasomotor centres; it is later depressed, owing to exhaustion of cardiac muscle. It retards respiration, diminishes secretion of saliva, depresses irritability of motor area of cerebral cortex, and lowers pathic sensibility. It causes prolonged dilatation of pupil, due to stimulation of sympathetic nerve. The drug has no action on peripheral or visceral temperature, nor does it accelerate the process of deoxidation of the blood. Its action would seem to resemble that of atropine, but it differs from this in that it depresses cerebral irritability. K. L. Pavloff (London Med. Recorder, May 20, '90).

Clinical effects of hyoscyne resemble in every way those of atropine. Gordon Sharp (Practitioner, Jan., '94).

Hyoscyne in frogs first quickens and then slows respiration, while larger doses cause a condition of narcosis and paralysis. In rabbits a dose of 3 grains only caused dilatation of pupils and quickening of the respiration; in cats and dogs the chief action is on motility; there ensue paresis of the extremities and ataxia; respiration is little affected, but there is marked mydriasis. The action on the circulation was slight, and none of the animals died, even after the large doses used. It antagonizes the action of muscarine on the heart, and is excreted in the urine.

In man $\frac{1}{600}$ grain causes distinct symp-

toms, dryness of mouth, faintness, and somnolence, but in the insane much larger doses can be borne with perfect impunity. The toxic dose lies between $\frac{1}{100}$ and $\frac{1}{50}$ grain. Serious symptoms, such as coma, cyanosis, paresis, and twitchings have been observed. Windscheid (*Deutsches Arch. f. klin. Med.*, B. 66, '99).

Treatment of Hyoscyamus Poisoning.

—If seen early enough, emetics or warm drinks should be administered, followed by the use of the stomach-tube. Tannin and charcoal may be used if a stomach-tube is not at hand and absorption has not taken place. Among the antidotes advised are coffee, alcohol, pilocarpine ($\frac{1}{8}$ to $\frac{1}{4}$ grain), muscarine nitrate ($\frac{1}{30}$ to $\frac{1}{15}$ grain), morphine sulphate ($\frac{1}{8}$ to $\frac{1}{2}$ grain), or eserine ($\frac{1}{200}$ to $\frac{1}{60}$ grain). The violent action of the drug should be restrained by the use of the foregoing antidotes given by hypodermic injection, in moderate doses, and repeated at intervals, as indicated by the condition of the patient and the urgency of the symptoms.

Case of poisoning by 6 drachms of the tincture of hyoscyamus observed, marked by symptoms very similar to those of belladonna poisoning. The respiration was, however, entirely unaffected. A. H. Dodd (*Brit. Med. Jour.*, Sept. 21, '89).

Case in which one grain of the hydrobromate of hyoscyne was made up to a 1-per-cent. solution in water. Two drops of this solution were put into one eye, and as the patient felt no pain she put 2 drops into the other eye as well.

Five minutes afterward she complained of giddiness and a feeling of lightness in the head; she staggered, and had to be assisted to bed. Then great dryness of the mouth and throat with thirst supervened. The giddiness increased, gradually the senses became confused, and the power of speech was lost. Complete muscular relaxation became pronounced and she became rapidly unconscious. The breathing was slow and occasionally

deep sighing. The face was flushed, the pulse full and regular.

This unconscious stage lasted for about four hours, and was succeeded by a period of semiconsciousness. At times the patient seemed to have perfectly recovered; at other times she was quite delirious. She talked incessantly, was occasionally irritable, although, on the whole, it took the form of a pleasant delirium.

After about two hours of this delirium she became gradually calmer, and then dropped off into a sound and seemingly natural sleep, which lasted for about an hour and a half. When she awoke she remarked that she had not slept so well for a long time. She had no remembrance of the events of the night further than being assisted to bed. There were no evil after-effects. The adhesions have stretched slightly. R. A. Morton (*Brit. Med. Jour.*, Feb. 8, '96).

Case of poisoning in a man 69 years of age, who had been given a mixture supposed to contain $\frac{1}{200}$ of a grain of hyoscyne hydrobromate in each drachm of the mixture. The dose was a teaspoonful. Through a mistake of the druggist the amount contained in a single dose was $\frac{1}{12}$ of a grain. A teaspoonful of the medicine was given at 9.15 P.M., just before going to bed. After swallowing it the patient undressed and got into bed, but complained of dryness of the throat, and his speech was thick. Two or three minutes after getting into bed the breathing was deep, and the patient could not be aroused. A half-hour later he was comatose, with stertorous breathing and flushed face. The pulse was 80 per minute and regular, the pupils were dilated and equal, with a slight conjunctival reflex. The stomach was washed out, and through the stomach-tube was administered 8 ounces of strong, black coffee with 1 ounce of brandy. Eleven hours after taking the dose the patient was conscious and able to speak, and from then on made an uneventful recovery. J. C. W. Given (*Lancet*, Jan. 2, 1904).

Therapeutics.—The chief use of hyoscyamus is as a sedative to the nervous

system. Spasmodic conditions, vesical pain and irritation, pertussis, and nervous coughs are relieved by preparations of hyoscyamus. In insanity hyoscine hydrobromate is given to allay acute or chronic maniacal excitement (by mouth, $\frac{1}{100}$ grain to $\frac{1}{80}$ grain; by injection, $\frac{1}{100}$ to $\frac{1}{60}$ grain). It is indicated in general paresis, melancholia, epileptic insanity, or quiet forms of mental aberration. In spermatorrhœa and nocturnal emissions hyoscine is of great value.

Chloride of hyoscine to be given in doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain. In various forms of chronic psychoses, in which other narcotics had proved themselves of no value, the drug was continued as long as six months, with but slight interruption, and gave, as a rule, eight hours' rest. In 25 per cent. of the cases, however, it could not be used, either on account of the dryness of the mouth, because the patients became accustomed to its use, or because an exciting instead of a quieting effect was produced. Oringe (*Hospitaltidende*, vol. ix, No. 16, '91).

In asylum practice hyoscine has largely supplanted morphine in the treatment of acute mania, the violence of acute melancholia and of general paresis, and as an hypnotic in general. It is remarkable for the absence of untoward after-effects. Hyoscine is most serviceable in cases of cerebral disease requiring an anodyne. After the administration of small doses of hyoscine in suitable cases the sleep produced is quiet and refreshing, and the system remains free from the after-headache, nausea, hebetude, and constipation that follow in the wake of opium and other narcotics.

Administration of hyoscine of value in cases of senile trembling, paralysis agitans, and fibrillary agitation. In cases of chorea, and of various spasmodic affections of the nervous and respiratory systems, hyoscine may be given hypodermically, in doses of from $\frac{1}{200}$ to $\frac{1}{100}$ grain. Roberts Bartholow (*Med. News*, Dec. 12, '91).

For the tumultuous heart's action of Graves's disease application of ice to the

præcordium recommended, and, for a general sedative, hyoscine hydrobromate. Taylor (*Med. News*, Dec. 16, 23, '93).

Tried in five cases of hystero-epilepsy, and it was found that it would abort an incipient attack and one already developed, a dose of $\frac{1}{64}$ grain usually being sufficient. Tolerance was not established. Bela Nagy (*Pester Medicinisch-chirurgische Presse*, Nos. 8, 9, '94).

Hyoscine employed in a case of angina pectoris believed to be of neurotic origin, with excellent results. Ostwick (*Med. Record*, May, '97).

Many years' constant use of hyoscine has shown that patients do not behave the same under its administration. Old people, particularly in feeble health, are more profoundly affected by even moderate doses. If, after increasing the dose to $\frac{1}{60}$ grain, the desired effect is not obtained, it is useless to increase it further. Frequent doses are not required, two in twenty-four hours being usually sufficient. It produces sleep normally by allaying cerebral excitement and morbid motor activity. Nothing like curative effects have been obtained. H. S. Noble (*Yale Med. Jour.*, No. 8, 1900).

Hyoscyamus has anodyne powers and has been used in griping pains and neuralgias, and is often added to purgative pills to lessen the griping effect. It has been used with success in strangulated hernia, its effects—anodyne and antispasmodic—serving advantageously to overcome the constricting ring in mild cases.

Case of strangulated inguinal hernia in which reduction could only be accomplished after the patient had taken, dosimetrically, 30 granules of hyoscyamine and the same number of granules of sulphate of atropine, followed by 45 grains of chloral-hydrate in 1 ounce of the syrup of morphine. Lemarié (*Jour. of Med. and Dosimetric Therap.*, Apr., '91).

Left crural hernia reduced, after taxis had failed, by means of belladonna ointment and ice to the tumor and the internal administration, frequently re-

peated, of hyoscyamine and strychnine. Berruyer (Jour. of Med. and Dosimetric Therap., Apr., '91).

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HYPEROPIA, OR HYPERMETROPIA.—From Gr., *ὑπέρ*, over, and *ὥψ*, sight, was proposed by Helmholtz. Later Donders introduced the root *μέτρον*, measure, into the word, changing it to “hypermetropia” to make it correspond with other terms introduced by him as ametropia and emmetropia. The term is often replaced by the abbreviation H.

Definition.—That error of refraction in which the principal focus of the dioptric media lies behind the retina. Rays parallel when they enter the eye tend to focus behind the retina and are intercepted before they come to a focus: the eyeball is too short from before backward.

Symptoms.—If the hyperopia is of very high degree the eyeball is usually small in all directions, appears deep set, and noticeably fails to fill the orbit. The pupil is small from contraction of its sphincter, associated with excessive exertion of the accommodation. Through a similar association there may be convergent squint, either constant or occurring when the attempt is made to see near objects clearly.

When the power of accommodation has been lost, as by age or the use of atropine, vision is imperfect at all distances. With sufficient accommodation clear vision is possible by excessive exertion of the ciliary muscle. This causes headache, most frequently frontal, sometimes occipital. Strain of the accommodation also causes chronic or recurring conjunctivitis, redness or inflammation of the lid-margins, styes, etc. The use of accommodation to correct the hyper-

opia leaves less for the focusing of near objects. Hence presbyopia appears early, requiring the use of convex lenses for near work before the age of 45. In high degrees continuous near-seeing may be impossible even from childhood, or objects may be held very close to the eye to make up for imperfect focusing by enlarged retinal images. In old age the convex lenses needed are stronger than would be required for failure of accommodation alone. The eye-strain may lead to inflammation of the choroid, optic nerve, or retina. The defect tends to give a distaste for reading and other occupations requiring near vision.

In youth the focusing muscle can so mold the soft crystalline lens that fine print is distinct as near as three or four inches to the eye. As age advances the lens hardens and decreases the active focusing power until fine print, such as foot-notes, can no longer be read at the proper reading distance. This condition is presbyopia. The active focusing power gradually decreases until about the seventieth year, when the focusing muscle loses nearly all power over the hardened lens, and at this age the perfect eye needs for reading a magnifier equal in strength to what the active focusing power was just before presbyopia came on. Until the fiftieth year most people with far-sighted, near-sighted, and astigmatic eyes can read fine print with glasses which totally correct these imperfections. Many at fifty-five years of age and some at sixty can do this. Many with normal distant vision at fifty to sixty years of age have never used reading glasses, and yet are a trifle far-sighted or astigmatic. Presbyopia does not come at the fortieth year. Those who need glasses this early have far-sightedness, near-sightedness, or astigmatism. Belladonna is not used in testing the eyes of the aged; so the focusing muscle may mask imperfections after the fortieth year almost as much as earlier. Latent imperfections may exist until the sixty-fifth year. N. B. Jenkins (Medical News, Sept. 28, 1901).

Etiology.—Hyperopia may be due to flattening of the cornea or crystalline lens, making the focus of the eye unusually long: *hyperopia of curvature*. More commonly it is due to the antero-posterior axis of the eyeball being shorter than the normal standard: *axial hyperopia*. It may also be caused by the absence of the crystalline lens, as from injury or extraction for cataract: *aphakial hyperopia*. Hyperopia is usually congenital. Nearly all eyes are hyperopic at birth, and 70 per cent. continue so throughout life. It tends to increase after the age of forty years through the continued growth of the crystalline lens.

Varieties.—Hyperopia that cannot be corrected by the accommodation the eye possesses is called *absolute H*. That which is still corrected by accommodation in spite of efforts to relax the ciliary muscle is called *latent H*. That which can be revealed without use of a mydriatic (cycloplegic) is called *manifest H*. That which can be either corrected or revealed is called *facultative H*.

Diagnosis.—When distant vision remains equally good or is rendered clearer by convex lenses hyperopia is present, and the strongest convex lens that allows clear distant vision comes nearest to measuring the hyperopia. The slightest hyperopia is rendered manifest by testing both eyes together, beginning with convex lenses that are too strong and making them weaker until distant vision is clear. To find its full amount it is often necessary in young persons to employ a mydriatic (cycloplegic).

With a convex lens before it the hyperopic eye can see clearly beyond the focal distance of the lens; and by sciascopy the point of reversal is found beyond the principal focus of the lens.

Treatment.—Hyperopia requires correction by a convex lens. Usually one

strong enough to correct all of it is best. The lenses should be worn constantly if there is convergent squint, headache, or inflammation of the eye or its appendages. If symptoms only arise after use of the eyes for near work, wearing of the correcting lenses at such times may be enough. Diminishing the amount of near work required of the eyes may give relief. Persons who are hyperopic but suffer no inconvenience from the hyperopia require no treatment for it. Hyperopia co-exists with astigmatism in the majority of cases; and the very careful measurement and correction of both errors of refraction may be necessary to render the glasses at all satisfactory.

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HYPERTROPHY OF THE HEART.

Definition.—Increase in the thickness of the walls of the heart. The process may be general, affecting the entire organ. More often it is confined to, or predominant in, one side of the heart. The left ventricle is rather more often affected than the right. The amount of muscular tissue in the auricles is scanty even when under the influence of hypertrophic changes.

Varieties.—*Simple* hypertrophy is associated with a normal size of the cardiac cavities. *Eccentric* hypertrophy implies enlargement of the cavities as well as thickening of their walls. *Concentric* hypertrophy—thickened walls encroaching on the cavities—is seldom, if ever, met with. (It is said to occur as a congenital condition. Its existence in any particular case should not be affirmed until by prolonged soaking in water all *rigor mortis* has softened.)

Symptoms.—It is astonishing how little subjective disturbance may be present, even when the hypertrophy is

pronounced. To be sure, the enlargement is an attempt on the part of nature, as we shall see under ETIOLOGY, to avert symptoms; yet we wonder how the bulk and strength of the organ can fail, as they often do, to attract its owner's attention. There may be cardiac discomfort, throbbing or heaviness, especially when lying on the left side, but seldom any pain. Sometimes there are signs of cerebral hyperæmia: vertigo, tinnitus aurium, flashes of light, headache, and disturbed sleep. In a general way, it is fair to say that the more prominent the subjective symptoms are in any patient, the more likely it is that he has something more than pure hypertrophy: either a merging of the hypertrophy into dilatation or else some neurotic disturbance.

Objectively, we notice the pulse, the chest-wall, the epigastrium, and the heart itself. The pulse is regular and of good strength. It is usually not rapid, except in exophthalmic goitre. Irregularity and intermittence suggest failing compensation. The wall of the artery may be normal, but in many instances it is rather stiff or presents the uneven ridges of calcification. It is said that in hypertrophy of the right auricle there may be such a regurgitation through the tricuspid valves (even if competent) before they completely close as to cause a venous pulsation in the root of the neck. This must be a rare phenomenon. Inspection shows a forcible, extended, and dislocated cardiac impulse. This may be powerful enough to render the thorax of a young subject asymmetrical, so that the lower part of the sternum and the ribs adjoining it on the left bulge forward. If the left ventricle is mainly affected, the apex is lower than normal and displaced to the left; if the right ventricle, the apex is displaced still more

to the left, but it is not lowered. Enlargement of the right ventricle is evidenced also by pulsation in the epigastrium and in some cases at the right edge of the sternum. Universal hypertrophy, as seen in some cases of aortic regurgitation, lowers the apex to the seventh or eighth intercostal space and displaces it to the nipple-line, while the whole body jars under its powerful efforts like a small tug-boat with a large engine. Upon palpation the apex seems blunter than normal, and its impulse is slow and powerful, contrasting with the rather spiteful tap of dilatation. Sometimes the action of the auricles can be detected by the lightly-opposed hand. Percussion demonstrates an increased area of dullness, extending a trifle higher than normal, or even up to the second space, but exceeding the normal limits mainly in a lateral direction, one or two fingers' breadths to the right of the sternum, and as far as the nipple or the anterior axillary line on the left. Inasmuch as aortic regurgitation is sometimes associated with dilatation of the aorta, we may in this disease get dullness in the second right interspace at the right edge of the sternum.

The first sound at the apex is dull and loud. It has a booming quality, contrasting with the valvular snap of hypertrophy. A reduplication of the first sound at the apex (gallop-rhythm) is ominous of beginning cardiac debility. At the base the first sound is not heard so distinctly as in dilatation, while the second sound is loud and clear, with strong accentuation of that valve (aortic or pulmonary) which corresponds to the obstruction that the hypertrophy is trying to overcome. For instance, in chronic nephritis the aortic second sound is accented, and, in right-sided hypertrophy, the pulmonic. In the presence

of valvular lesions it need not be said that the murmurs caused by them more or less modify or replace the physiological sounds.

Differential Diagnosis.—Nervous palpitation does not give the sensation of strength in the cardiac impulse, although if long continued it merges into hypertrophy. The sounds are more valvular and have a certain "irritable" character.

Dilatation has a feeble impulse, coming against the chest with a weak slap. The first sound at the apex has less muscular quality than in health, while in hypertrophy the difference is the other way. In other organs we notice signs of failing compensation. There are dullness and moist râles at the base of the lungs or even hydrothorax. The liver is enlarged. Dependent parts are œdematous. The urine is scanty, high-colored, with an excess of urates and more or less albumin.

Care must be taken not to mistake a displaced heart for an enlarged one, whether the change in position be due to thoracic tumor, pleural effusion, or pressure through the diaphragm. Again, the retraction of the lung because of chronic phthisis or failure to expand after pleurisy may expose a normal heart in an abnormal way. On the other hand, emphysema may mask actual hypertrophy. In a complicated case under my care a left-sided pneumothorax, limited by adhesions, acted similarly.

The area of dullness in pericardial effusion is triangular, with the base downward. That of a generally-hypertrophied heart is ovoid. Moreover, the feeble impulse and distant heart-sounds would at once exclude hypertrophy.

It is advisable in every case to establish the cause of the hypertrophy. When this can be done it confirms the diag-

nosis,—besides having a possible influence upon treatment.

Etiology.—Hypertrophy results from increased demands upon the circulation. An essential condition for its development is a fair degree of cardiac and systemic nutrition. A patient far advanced in phthisis cannot develop hypertrophy, nor will greatly-occluded coronary arteries supply to the myocardium the requisite material for new growth. The causes of hypertrophy may be enumerated as follows: 1. Obstruction to the general circulation, as occasioned by coarctation of the aorta, hypoplasia of that vessel, or compression of it by deformed chest-walls or tumors.

Aneurism might be expected to cause hypertrophy, but it seldom does, unless associated with aortic regurgitation. Atheroma of the aorta is set down as productive of hypertrophy. It embarrasses the heart because it increases the friction of the blood-current and diminishes the elasticity of the artery. Conversely hypertrophy tends to produce atheroma by maintaining a high arterial pressure; so that the two conditions are apt to co-exist. Other things which increase the labors of the left ventricle and enlarge it are arteriosclerosis, acute and chronic nephritis, and, to a certain extent, pregnancy.

Enlargement of the heart in Bright's disease as a useful, compensatory process. It is well known that the cells of the convoluted tubules remove excrementitious matter from the blood. Since a great number of these cells are destroyed by the connective-tissue proliferation, an increased amount of work falls upon the remaining ones, which require a large amount of fluid to prevent an accumulation of the toxic products within them. Thus follows polyuria, and this again necessitates cardiac hypertrophy. Although the process so far is salutary, it is obvious that the greater strain to

which the arterial system is exposed will eventually lead to endarteritis, while finally there must come a time when either the overworked heart or blood-vessels will no longer bear the pressure, and degenerative process will occur. A. Bier (*Münchener med. Woch.*, Apr. 17, 1900).

2. A second class of the causes of hypertrophy includes those conditions which obstruct the lesser or pulmonary circulation, viz.: tumors, excessive pleural effusion, emphysema, chronic interstitial pneumonia, and some cases of phthisis. Orth states that some cases of chronic bronchitis exhibit a degree of hypertrophy of the right ventricle not accounted for by the amount of emphysema present. 3. Valvular lesions are sure to cause hypertrophy unless the patient is too feeble, or unless he is overwhelmed by the shock of their sudden development, as, for example, when a cusp of the aortic valves is torn off by violent exertion. More will be said about the valves under **PATHOLOGY**. Chronic adhesive pericarditis causes hypertrophy, particularly when, besides the obliteration of the pericardial space, there is adhesion of the outer surface of the pericardium to the pleura. Interstitial myocarditis is another cause. 4. Long-continued and severe muscular exertion—as exemplified in blacksmiths, iron-molders, coal-miners, and longshoremen—may endanger the heart; also prolonged or habitual mental excitement or worry, to some extent. 5. Somewhat allied to the preceding causes are exophthalmic goitre and excess in tea, coffee, tobacco, alcohol, and venery. Sometimes more than one cause operate in a single person. Laborious occupations affect much more severely the free drinkers than the total abstainers. Brewery-workmen illustrate this; although it may be that the effect of beer is due not

merely to the alcohol it contains, but also to the large amount of liquid and to the carbohydrates dissolved in it, which would, in an excessive drinker, tend to keep the arteries at rather high tension.

In embryonic life, and for a time after birth, the heart grows by increase in size and by division of the muscle-cells. Later, the growth of the heart depends essentially upon the enlargement of the muscle-cells alone. In hypertrophy of the heart, produced by artificial lesions of the aortic valves, true dilatation of the left ventricle always precedes the hypertrophy. Hypertrophy may develop even when the general nutrition of the body is very unfavorable, and in hypertrophy the increase of the weight of the heart and of the transverse diameter of the muscle-cells is proportional. Tangel (*Virchow's Archiv*, June, '89).

Heart-hypertrophy follows any condition or set of conditions increasing the amount of work done by the heart. The causes of heart-hypertrophy may be divided into two broad classes: (1) causes lying in lesions of the heart itself, interfering with proper function; (2) causes outside the heart.

The first class is subdivided into (a) lesions of the valves, and (b) lesions of the heart-wall. Of 105 cases of heart-hypertrophy valvular lesions were present in 13. Of lesions affecting the heart-wall there were found myocarditis, tuberculosis, and aneurism. In some cases of localized myocarditis there is a compensatory hypertrophy of other portions of the same wall. An aneurism of the heart-wall may throw out of function so large an area of muscle that the remainder must hypertrophy to make up for the portion lost. Again, an aneurism may be so situated in the heart-wall that the function of one or more of the valves may be interfered with.

The second class of causes of heart-hypertrophy may be subdivided into (a) causes acting directly and interfering mechanically with the contraction of the heart, and (b) causes acting by increasing the general arterial blood-pressure.

Cases of the first class resolve themselves into pericardial adhesions. There were 8 examples of this lesion, and of these 4 were tuberculous.

In 7 out of 8 cases there were hypertrophy and dilatation of the right ventricle,—in most cases extreme,—and in 5 cases uniform dilatation of the whole heart.

Of the causes acting by increasing the general arterial blood-pressure, some offer mechanical obstruction to the blood-flow in territorial areas, others to the blood-flow in the whole general arterial system. To the former class belong (*a*) nephritis, and (*b*) pressure of tumors and the like upon vascular trunks.

There were 14 cases of left-ventricle hypertrophy associated with nephritis without arteriosclerosis. This number included only 1 case of acute nephritis.

Causes producing mechanical obstruction to the blood-flow in the whole arterial system include (*a*) the action of drugs and poisons (as alcohol, digitalis, and tobacco); (*b*) excessive work; (*c*) hydræmic plethora (including general arterial hypoplasia); (*d*) cardio-nervous influences; (*e*) arteriosclerosis.

Arteriosclerosis was found to be by far the most common cause of left-ventricle hypertrophy. It is the most frequent of all causes of heart-hypertrophy due to conditions lying outside the heart, occurring in subjects over thirty years of age. Of the 105 cases of heart-hypertrophy from all causes, there are 62 cases dependent upon arteriosclerosis. Of these 62 cases, 38 had well-marked chronic diffuse nephritis, 17 slight chronic diffuse nephritis, 3 subacute nephritis, 1 acute glomerulonephritis, and 3 normal kidneys. Aneurism of the aorta occurred in 4 cases. In 20 cases there were valvular lesions. In most of these hearts the coronary arteries were dilated, thickened, and tortuous, and the seat of recent or chronic endarteritis. W. T. Howard (Johns Hopkins Hosp. Reports, vol. iii, Nos. 4, 5, 6, '93).

Hypertrophy is never primary, and dilatation always precedes hypertrophy in a hard-working heart, whether the increased labor be due to resistance from

within or from without or to nervous stimulation and augmented action. J. G. Adami (Montreal Med. Jour., May, '95).

Statistics showing the proportion in which the various causes manifested themselves in 360 cases. Cardiac hypertrophy, due to some cause or other, was found to exist in no less than 105 cases. Of these arterial sclerosis was found to be the cause in 59 per cent.; chronic nephritis in 13.4 per cent.; valvular lesions in 12.4 per cent.; adhesions of the pericardium in 7.6 per cent.; excessive muscular work in 3.8 per cent.; tumors in 1.9 per cent.; aneurisms in 0.95 per cent.; hæmic plethora in 0.95 per cent. More than 50 per cent. of the cases of cardiac hypertrophy in general hospital work were due to arterial disease. Lafleur (Montreal Med. Jour., May, '95).

Hypertrophy of the heart directly consecutive to toxic nephritis noted in two experiments undertaken to investigate the pathology of cancer. Two rabbits were inoculated with an aqueous extract of macerated human cancer, after being previously treated by subcutaneous injections of cantharidin in oil, in order to determine the localization of the malignant growth by means of a renal lesion. In neither case was any malignant growth found post-mortem, but in both distinct nephritis as well as marked hypertrophy of the left ventricle was seen. The first rabbit, which weighed 1885 grammes, received in five doses 1½ milligrammes (1/10 grain) of cantharidin between May 19 and June 1, 1895. Albumin was found in the urine soon after the first injection, but disappeared again after the third. After a transitory loss of weight the animal thrived until December, when it showed signs of spasmodic paraplegia (due to myelitis caused by cancerous toxins) and died in January, 1896. On examination the kidneys were found increased in size and showed a uniform gray surface on section, there being no sharp distinction between cortex and medulla. The wall of the left ventricle was much thicker than normal, being twice the normal size as seen in other rabbits of similar weight. In the second case the rabbit was much larger, weigh-

ing $3\frac{1}{2}$ kilogrammes. The same dose of cantharidin, $1\frac{1}{2}$ milligrammes, was administered in three injections. The urine contained albumin after the first dose, but not after the third. The animal wasted rapidly and died in a state of profound cachexia. The kidneys were found in the same condition as those of the first animal, and the left ventricular wall was noticeably thickened, though not so much so as in the first case. Thus a diffuse nephritis of toxic origin produced marked enlarge-

ment of the left ventricle within a few months in both instances, the duration in the second case being the shorter of the two. Mayet (*Lyon Médicale*, Jan. 19, 1902).

should be of about the same bulk as the closed fist of the subject. The wall of the normal left ventricle is about $\frac{1}{2}$ inch in thickness, and of the right $\frac{1}{4}$ inch, or a little less. The left ventricle seldom attains the thickness of 1 inch; the right may reach $\frac{3}{4}$ inch, and it has been reported as being even more than an inch in thickness. The auricles are never very thick. The left in health is about $\frac{1}{3}$ inch and may become $\frac{1}{4}$ inch when

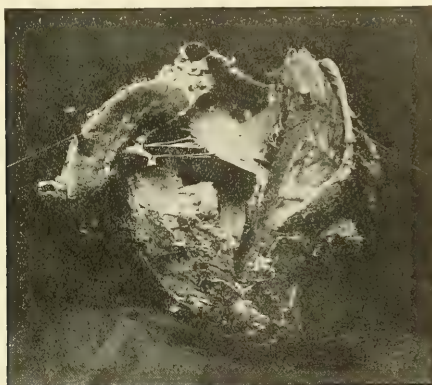


Fig. 1.—Excentric hypertrophy, due to adhesive pericarditis.

Pathology.—The muscular fibres of an hypertrophied heart are increased in size somewhat, but mainly increased in number. Macroscopically, the cut surface is red and firm. The extent of the hypertrophy can be determined by the size of the organ, the thickness of its walls, and its weight. A normal heart

hypertrophied. The right auricle is still thinner, and shows its tendency to hypertrophy by changes in its auricular appendix rather than in the rest of its cavity. Before measuring the walls, *rigor mortis* should be relaxed, as already advised, by soaking in water. Mere inspection may prove deceptive as to the existence or not of hypertrophy in cases of eccentric hypertrophy, because the walls may look relatively thin and yet be absolutely hypertrophied. Weighing is a valuable procedure. The normal

heart weighs 8 or 9 ounces. In disease the organ may weigh 1 pound or $1\frac{1}{2}$ pounds, and exceptionally 3 pounds, *i.e.*, as much as the liver!

[*Description of cuts:* Fig. 1. Excentric hypertrophy as a result of chronic adhesive pericarditis in a man aged 26 years. Weight of heart with pericardium, 1328 grammes (44 ounces). Valves competent. Wall of left ventricle $2\frac{1}{2}$ centimetres thick; of right ventricle 5 millimetres. Patient of Dr. F. C. Shattuck, at one time under the care of the writer. Specimen due to the courtesy of Dr. J. H. Wright.

Fig. 2. Boy, aged 6 years, in the writer's wards with excentric hypertrophy due



Fig. 2.—Excentric hypertrophy due to mitral regurgitation.

to mitral regurgitation. The black line indicates the extent of cardiac dullness. Two attempts to obtain a radiograph were unsuccessful. HERMAN F. VICKERY.]

Results of the autopsy on a child that died during birth. Both of the patients were healthy, and the child itself did not appear to be abnormal in any way, except that the heart, after evacuation of the blood, weighed 44 grammes: more than twice the normal weight. The wall of the right ventricle varied from 0.75 to 1 centimetre in thickness; the left from 1 to 1.25 centimetres. The septum was 0.75 centimetre wide. Microscopically, the muscle-valves and vessels appeared to be normal. The case is, therefore, one of uncomplicated, primary, congen-

ital hypertrophy of the heart. Simmonds (*Münchener med. Woch.*, Jan. 24, '99).

Of course, the immediate effect of any of the causes of hypertrophy is manifest in the corresponding portion of the heart, and not in the whole organ. Aortic stenosis and regurgitation enlarge the left ventricle. In time, however, stasis is produced in the pulmonary circulation, and the right ventricle also hypertrophies. Valvular lesions, whether regurgitant or obstructive, cause an appropriate part of the heart to hypertrophy, and then, sooner or later, more or less directly (with one exception) entails increased labor upon all the other portions of the heart. The exception is mitral stenosis, which affects the left auricle, the right ventricle, and the right auricle, and then tends to cause stasis in the general venous return, with consequent obstruction to the outflow of blood from the left ventricle and aorta into the arterial capillaries; but this obstruction to the expulsive efforts of the left ventricle does not result in hypertrophy of that portion of the heart, because so little blood is admitted into it through the stenosed mitral valve.

The greatest hypertrophy occurs in aortic regurgitation (*cor bovinum*). There is first excentric hypertrophy of the left ventricle. When this reaches sufficient size, there arises relative insufficiency of the mitral valves, and thereupon hypertrophy of the left auricle and the right side of the heart.

The inevitable result of hypertrophy is eventual debility and failure. By the time of death dilatation may far surpass hypertrophy; or the hypertrophied muscle may be more or less changed by fatty degeneration. In some cases the muscular condition is apparently so good that the pathologist surmises failure of the

nervous mechanism to be the terminal factor in the case.

Prognosis.—As just stated, the condition must terminate unfavorably. So long, however, as the hypertrophy compensates for the obstacle which rises to it, or grows proportionally with any augmentation of that obstacle, the patient may feel perfectly well. Even during this time of perfect compensation he may, however, suffer from cerebral hæmorrhage or (if the hypertrophy affects the right ventricle) pulmonary hæmorrhage. Escaping these dangers, he may do well for years, but finally dies, either from dilatation or fatty degeneration or the failure of innervation already mentioned.

Treatment.—The care of a patient with hypertrophy demands that we should allow nothing to aggravate the condition, and should in every way possible promote the nutrition of the myocardium. The etiology must be considered. Tobacco and alcohol must be forbidden and excitement and worry averted. Simple, nutritious food should be taken regularly in moderate quantity. It would be better to permit lunches than the ingestion of a large amount at one time. Moderate and habitual exercise is beneficial. The exact amount and character may be determined partly by the experience of the patient: dyspnoea and palpitation are not to be caused by it. If there is discomfort and throbbing in the left chest, bromides may be useful, or a drop or two of tincture of aconite, or *veratrum viride*, thrice daily. In a stout patient an occasional saline purge may be useful.

Treatment for hypertrophy itself is out of place, and the restriction to low diet or the use of aconite is sometimes dangerous. We have really to consider not the treatment of hypertrophy, but the treatment suggested by the hypertrophy. It may be necessary to diminish the volume

and improve the quality of the blood by appropriate diet, hygiene, and tonics. It may be desirable, also, to diminish the resistance of the arterio-capillary network by aperients, eliminants of various kinds, and by relaxants of the arterioles and capillaries, such as nitroglycerin and the nitrites. By these means the work thrown upon the heart is reduced, and, if necessary, the heart may also be strengthened by strychnine and digitalis. Broadbent (*Lancet*, Mar. 21, '91).

Blood-letting at times, of life-saving usefulness, when the right side of the heart becomes engorged and overdistended by increased obstruction to the flow of blood through the lungs or left side of the heart,—a condition not rarely observed in intense bronchitis, especially when complicating emphysema, pulmonary œdema, and incompetence or stenosis of the mitral orifice are present. J. E. Atkinson (*Maryland Med. Jour.*, Dec. 29, '94).

The treatment of cardiac hypertrophy is much the same in all cases, regardless of cause. Walsh and Page are in accord as to the great value of aconite—1 drop every two hours until its effects are manifest. Page deprecates digitalis, recommended by Walsh and Osler as a cardiac stimulant, when valvular trouble is present, broken compensation being the signal for its use. The latter authors are also in accord regarding the value of blood-letting, Osler emphasizing the fact that with signs of dilatation—as indicated by gallop-rhythm, urgent dyspnoea, and slight lividity—venesection is, in many cases, the only means by which the life of the patient may be saved; 20 to 30 ounces of blood should be abstracted without delay. Strümpell practically advises the same remedies as Osler. When compensation has been established, Strümpell recommends baths ranging from 90° to 93° F., which are well borne by the patients and exercise a peculiarly beneficial and invigorating influence upon the heart. F. W. Campbell (*Montreal Med. Jour.*, June, '95).

Engorgement of the portal system is almost always present in heart disease. Mercurial purges given in long-continued small doses are of the greatest impor-

tance in these cases: $\frac{1}{2}$ grain or even $\frac{1}{100}$ grain of corrosive sublimate with tincture of the chloride of iron will effect revolution by aiding true heart-tonics. Adonidin, cactus, convallaria, or others of newer remedies are of no real value. Satisfaction in real heart trouble is only obtained with nitroglycerin, strophanthus, and digitalis. Horatio C. Wood (Cleveland Med. Gaz., Aug., '95).

In arterial tension, opium and iodides are followed by a rebound when taken for weeks or months. This can be prevented by giving short courses of sodium salicylate to carry off accumulated uric acid, the cause of increased arterial tension. A. Haig (Therap. Gaz., Sept. 16, '95).

Mercury is valuable far beyond its supposed alterative action. Its special benefit is exercised in dilated and hypertrophied heart. To give digitalis a fair chance, preliminary doses of mercury are absolutely necessary. William Murray (Lancet, Sept. 28, '95).

The following method of treating cases of dilatation and hypertrophy resulting from overexertion advised: In marked cases rest in bed. Stimulants, such as brandy, wine, ether, etc., tend to irritate the organ. Digitalis is very useful in many cases. The use of strophanthus preparations and the ordinary medical cardiac stimulants in addition to digitalis may be employed. Calomel affords great service after the other cardiac remedies fail. Narcotics and hypnotics are to be used with great care. Ice-bags are of doubtful value. Blood-letting is to be recommended. The use of aerated beverages is to be avoided. Hermann Rieder (Deutsche Archiv f. klin. Med., B. 55, p. 8, '95).

A daily cool bath, with rubbing, is a good tonic. Hot baths and Turkish baths are unfavorable or dangerous.

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Boston.

HYPNOTISM.

Definition.—Hypnotism is a subjective psychical condition, composed of hypnosis, a pseudosleep-like state, in which the

subject's natural susceptibility to suggestions is increased, and usually a post-hypnotic period of varying lengths, during which certain acts, suggested by the hypnotist while the subject was in a state of hypnosis, are performed.

[According to Moll, "A person in an hypnotic state is called an hypnotic, or subject. A hypnotist is a man who hypnotizes for scientific purposes. A hypnotizer is a man who makes hypnotism a profession." J. T. ESKRIDGE.]

A post-hypnotic suggestion is a suggestion made during the period of hypnosis for the patient to follow out after the stage of hypnosis has passed away, and the subject has returned to apparently normal consciousness. It is probable that, during the time in which post-hypnotic suggestions are actually being followed out, the subject is in a state of partial hypnosis.

Inducing Hypnosis.—There are several methods by which hypnotic sleep may be induced. When these have been divided into two classes they have been termed the physical and psychical.

[The latter I prefer to call the suggestive method, and is the one that I usually employ except for very nervous, self-conscious, or hysterical subjects. I shall only briefly refer to some of the physical methods of inducing hypnosis, and then describe in greater detail the one I commonly employ, as I found it attended with least nervous strain to the subject hypnotized. J. T. ESKRIDGE.]

It is well for the patients to avoid, during the induction of hypnosis, as well as during the hypnotic state, everything that tends to excite or increase their nervous tension. Hypnosis may be induced by requesting the patient to fix his eyes intently on some bright object—such as a button or a lighted candle held a short distance from the eyes, a little to one side and nearly on a level with the top of the head—until the eyes close from fatigue, when the hypnotic

condition may be completed by the hypnotist making passes with his hands from above downward. The hands need not be in actual contact with the patient, but the operator should stand in front of his subject and the stroking should be from the upper portion of the face downward as low as the hips or knees. Braid often resorted to the above method. Staring at a spot on the ceiling or at revolving mirrors has been successfully employed to induce hypnosis. The eyes must be held in an uncomfortable and strained position. The best position for this is looking upward and slightly to one side.

[Professor Charcot employed at times, especially for the hysterical, a sudden flash of an electric spark, the noise of a loud-sounding gong, or a stern command to go to sleep. He also modified the Braid method by placing pieces of glass close to the bridge of the nose. This procedure causes strong convergence of the eyes and quickly produces sleep, but it often throws the hysterical subject into a cataleptic condition. He induced hypnosis in some by pressure on an "hypnogenic" or "hysterogenic" zone, such as an ovary or the top of the head. It is said that if a powerful magnet is brought near some hysterical subjects it will cause sleep. J. T. ESKRIDGE.]

After an hysterical person has been hypnotized a few times her staring intently at her own image in a mirror may cause hypnosis, the patient remaining in a cataleptic condition. Some employ a species of fascination by requesting the subject to look the hypnotist fixedly in the eyes until suggested movements are made or spoken commands are performed. The effect of the fascination is apparently increased if the subject grasps the hands of the operator while each stares in the other's eyes. If the hypnotist presses on one or both ears of the subject or firmly holds the eyelids closed and exerts gentle pressure on the

eyeballs, through the closed lids, hypnosis may result, especially if the person operated upon is endeavoring to concentrate his mind intensely on some subject.

To successfully effect hypnosis some co-operation on the part of the patient is necessary. This may be essentially passive, but it is the inability to resist that constitutes the neurotic stigma. A. A. Eshner (Phila. Polyclinic, Dec. 11, '97).

[The first person whom I ever hypnotized I did so without intending or thinking of hypnotism at the time. The subject unintentionally and involuntarily went into a profound state of hypnosis. J. T. ESKRIDGE.]

The effects obtained by using the method of Salpêtrière and that of the school of Nancy compared. To produce hypnosis the method of verbal suggestion is much more quickly and permanently active than mere fixation of an object without verbal suggestion. A Hoffman (Deut. med. Woch., Sept. 14, '99).

Realizing the dangers that may result from practicing hypnotism by the physical method (although, as is readily seen, no method is purely physical) and the unpleasant medico-legal questions that might arise against the hypnotist in the employment of this method, I have adopted almost exclusively the following: I first explain to the patient that hypnosis, as I endeavor to induce it, is nothing more than a condition into which the person voluntarily places himself by allowing his mind to follow my suggestions to the exclusion of every other thought. That I have not and never shall have any power to put him to sleep without his consent and desire. That after I get him to sleep I can make suggestions which he will carry out in his normal or awakened state without thought or voluntary effort on his part, and by this means I shall, to a great extent, be able to keep his mind off himself or his ailments. After the patient has

comprehended what I desire, he is placed in a comfortable posture, either sitting or reclining, preferably the former, when I request him to close his eyes and think of sleep as I suggest the phenomena to him, telling him that the whole matter is in his hands and I have nothing to do with his sleeping except as I suggest its phenomena which he must try to realize that he is experiencing. I endeavor in every case to free the patient's mind of any thought of the mysterious. I now request him to think of sleep, of his going to sleep, and repeat two or three times: "Your eyelids are getting heavy; you begin to feel drowsy; your head feels full and heavy; you experience an increased sense of drowsiness and a stronger inclination to sleep; your eyelids are getting heavier; you are feeling more and more drowsy; your arms begin to feel numb, sleepy, heavy, and powerless; a sleepy sensation is passing over your entire body and legs; my voice seems farther and farther off; now it appears to be far away, and to come from a great distance; your eyelids are now decidedly heavy, and you are going into a deep and soothing sleep; now you are asleep and cannot waken until I tell you to do so; you cannot open your eyes." If the patient does not succeed in opening his eyes on my requesting him to do so, but at the same time positively assuring him that he cannot open them, I begin to make the necessary therapeutic suggestions in regard to his ailment.

A combination of two or more of the different methods of inducing hypnosis is often desirable and may be necessary to hypnotize the very nervous, the apprehensive, the self-conscious, and the hysterical. I have not employed any but the suggestive method for a number of years, although I have frequently failed by this means in hypnotizing subjects

that I am sure could have been put into an hypnotic state by the use of other methods. Many of these, I am equally sure, would have been benefited by therapeutic suggestions made while they were in a condition of hypnosis.

[I hesitate to use any means that may be employed to deprive a person of consciousness against his will. I have never hypnotized a woman except in the presence of a third party, and for a number of years I have refused to hypnotize anyone unless a third party was present. After I have hypnotized a woman I always suggest that she will never come to my office alone. J. T. ESKRIDGE.]

Four rules formulated by Bernheim and Beaunis, which should always guide one in the application of hypnotism to the treatment of all disease: (a) Never use hypnotism without the consent of the subject or the legal guardian. (b) Never hypnotize except in the presence of a third party, who represents the subject. (c) Never make suggestions without the patient's consent: those necessary to effect a cure. (d) Never use authority over a patient to secure his consent, if you have reason to expect disagreeable effects from the experiment. J. R. Rose (Jour. Amer. Med. Assoc., May 20, '99).

Awaking the Subject from Hypnosis.

—The patient should never be awakened suddenly or in a state of agitation. One of the simplest methods is to suggest to the patients that they are gradually awaking and that within twenty or thirty seconds they will be wide awake with eyes open and feeling first rate, etc. One may suggest that the subject will gradually awake and then blow gently on the face. The eyelids may be raised and the patient called by name.

Susceptible Subjects.—All persons are not equally susceptible to hypnotic influences and some apparently cannot be hypnotized at all. A number partially yield to hypnotism, but to an insufficient degree to make them follow out suggestions. When hypnosis is attempted by

the operator suggesting to his subject the natural phenomena of sleep, those that are ordinarily termed hysterical and those that are intensely self-conscious are not easily hypnotized. On the other hand, when the physical, or Charcot, method of inducing hypnosis is employed, the hysterical, provided they are not at the time greatly agitated by their own thoughts and apprehensions, are readily hypnotized. The somnambulists, or sleep-walkers, yield most readily of all subjects that I have encountered. Those trained to unquestioning and implicit obedience, such as sailors and soldiers, make excellent subjects, as a rule.

[I have found that the Latin races are more easily hypnotized than the inhabitants of the northern portions of continental Europe, or the Englishman, Scotchman, Irishman, or American. J. T. ESKRIDGE.]

Too great a desire or an overanxiety to be hypnotized, amounting to a fear lest one may fail, not infrequently prevents one from yielding to hypnotic influences. Those that can concentrate their thoughts on suggestions to the extent of subjectively realizing that what the hypnotist is saying is really taking place are readily hypnotized. Disturbed attention from any cause greatly interferes with hypnosis. As a rule, the laborer and the chronic hospital invalid will yield more readily than the mentally active. It is a mistake to conclude because a person is hypnotizable that his mental power and attainments are poor, for many who are mentally strong are easily hypnotized after they have determined to yield to the hypnotic influence. Anything that interferes with the physical comfort of the subject or disturbs his thoughts will render him more difficult to hypnotize than when he is pleasantly affected by his surroundings. On the other hand, soothing influences, mental or physical,

favor hypnosis. An uncomfortable position of the body of the subject, a room that is overheated or too cold, a strong light, an attack of indigestion, pain, an overloaded stomach, the stimulating effects of alcohol, coffee, tea, or the nervous effects of a strong cigar increase the difficulties in inducing hypnosis. Likewise mental agitation, emotional excitement, worry, apprehension, pre-occupation of the mind, and self-consciousness have a similar influence. Hypnosis is favored by bodily comfort, twilight, a darkened room, music, the presence of fragrant flowers, and freedom from all influences that tend to prevent the mind from following a suggested train of thought. A fair amount of intelligence seems to be necessary for the induction of hypnosis. It is impossible to hypnotize the lowest grade of idiots. It is extremely difficult to induce hypnosis in the insane.

[After repeated efforts in trying to hypnotize a number of insane persons I have not a single success to record. Voisin claims to succeed in hypnotizing the insane. J. T. ESKRIDGE.]

Some are hypnotizable at one time and not at another. Some persons may not yield to hypnotism at the first attempt, but do so after repeated trials. A number, especially the hysterical, cannot be put to sleep by the suggestive method, but will rapidly go into a cataleptic state on employing the means usually used by Charcot and his followers. Some experimenters succeed in hypnotizing 80 or 90 per cent. of their subjects, while others cannot claim success in nearly so great a proportion; so that much depends upon the experience, the methods, the patience, and the individuality of the hypnotist.

SEX.—Personally I have succeeded in inducing hypnosis in a greater proportion of male subjects than of female. Lié-

bault and others have been able to hypnotize a larger proportion of their female subjects, although the difference is not great in favor of the susceptibility of the latter. The hysterical are often hypnotizable by the Charcot method, while they will rarely yield when the suggestive one alone is employed.

[I have not used the former method for a number of years, and this may account for my failure in inducing hypnosis in the extremely nervous and hysterical. J. T. ESKRIDGE.]

Cases of failure are probably due to conscious or unconscious resistance on the part of the patient, or to inability to fix the attention. Hysterical subjects are more difficult to hypnotize than others, while the insane usually cannot be hypnotized. A. Liébault (*Le Sommeil Provoqué*, p. 310, '89).

AGE.—Persons from about the sixth or seventh to the twentieth year make the best subjects for hypnotism. It is usually extremely difficult to hypnotize a child under four years of age. Middle-aged and elderly persons often readily yield to hypnotism, but, as a rule, they do not exhibit such a susceptibility as is generally found between the years of seven and twenty.

CLIMATE.—Residents of warm and tropical climates are said to be more easily hypnotized than inhabitants of colder countries. I have had no experience with the former except after they have immigrated to Colorado. Among our foreign population here the French and Italian are the most susceptible.

In estimating the proportion of persons who are hypnotizable many modifying circumstances have to be taken into consideration. Not the least of these is the personal influence of the hypnotist. Some may be hypnotized by one person and not by another of equal experience. He who succeeds in getting his subject

en rapport with himself will usually be able to induce the hypnotic state.

It is, in the employment of hypnotism as a therapeutic agent, as it is in the use of other aids to effect a cure, the personal equation of the hypnotist that plays a part of no small importance.

As a general rule, it may be stated that the oftener a person has been hypnotized the more easily subsequent hypnoses will be effected. In very nervous, self-conscious, and hysterical subjects, when only the suggestive method to induce hypnosis is employed, it often happens that the first attempt at hypnosis nearly succeeds, and that at every subsequent effort of the operator the failure is more and more pronounced, until finally no approach to hypnosis can be obtained. It is probably best not to rely entirely upon the suggestive method in inducing hypnosis in this class of subjects.

[In those cases in which I have succeeded at the first sitting in getting the patient thoroughly hypnotized, never have I failed of complete success in a subsequent attempt at hypnosis, provided the subject was in a good condition. It is a curious experience with me, it may not be new to others, that dipsomaniacs, during the time the intense desire for alcohol has been upon them, have not completely yielded to the influence of hypnotism nor have followed suggestions made at these times, notwithstanding I had often succeeded in completely hypnotizing them between their periodic drinking-bouts. J. T. ESKRIDGE.]

AS TO WHETHER A PERSON CAN BE HYPNOTIZED WITHOUT HIS KNOWLEDGE OR CONSENT OR AGAINST HIS DESIRE.—If the suggestive method only is employed in inducing hypnosis we are justified in affirming that a person cannot be hypnotized without his consent and voluntary co-operation. When one or a combination of the so-called physical methods is used in inducing hypno-

sis the subject may not only be hypnotized without his consent or desire, but against his wish in the matter.

[Pertinent to this subject Björnström says: "It certainly is true that a conscious and willing co-operation promotes sleep, but a number of cases are on record where the sleep appears unexpectedly, unconsciously, and against one's will." J. T. ESKRIDGE.]

Hypnosis: its Degrees and Variations.

—A clean-cut and terse description of hypnosis is very difficult, as the condition varies in different subjects, being modified to some extent by the normal temperament of the subject, his mental and physical condition at the time, the depth to which the hypnosis is carried, and the method employed to induce it. The ordinary subject, when hypnotized by the suggestive method, especially if every precaution is taken to soothe the patient and prevent his becoming nervous and excited, sits or lies as one in a quiet and peaceful sleep,—*the somnambulistic state*. Temperature, pulse, and respiration vary little from the normal; the face is usually slightly flushed; the voluntary muscles are relaxed and the head and limbs assume the positions forced by gravity. If the subject is nervous, apprehensive, or excited, and one of the so-called physical methods is employed to hypnotize the patient, the limbs may become rigid—*the cataleptic state*—or he may go into a profound and stuporous sleep,—*the lethargic state*. The latter condition is not produced primarily by startling the patient, by means of striking a loud-sounding gong, by the sudden flash of an electric spark, or by a stern command to sleep, such as will cause the cataleptic state suddenly to develop; but is produced by staring, or by pressure upon the eyeballs effected by means of the fingers held gently against the upper eyelids. Charcot recognized three stages, viz.:

(1) *the cataleptic*; (2) *the lethargic*; (3) *the somnambulistic*.

I shall not take up space here in describing the cataleptic (see CATALEPSY) and the lethargic conditions. The somnambulistic state is the most interesting, both for psychological and therapeutic purposes. It is induced most typically by the suggestive method of effecting hypnosis, although it may be caused by any method that affects the imagination, especially by staring. It may be brought about secondarily from the cataleptic or lethargic condition by the operator gently pressing or rubbing the subject's head. The insensibility to pain found in the somnambule is usually the result of the suggestion that the patient cannot feel pain, although it sometimes occurs without any voluntary suggestion on the part of the operator. There is no increase of muscular irritability, similar to what is found in the lethargic state. If the hypnosis is slight the muscular tone is nearly normal, but if it is deep the muscles are relaxed; yet slight muscular contraction can be caused in some cases by exciting the cutaneous nerves over the muscles. The special senses and memory are sharpened during hypnosis.

[Many claim that the mental faculties generally are improved while the subject is in a somnambulistic state, but my observations have led me to believe that this apparent improvement can be accounted for by the heightened state of activity of the special senses. J. T. ESKRIDGE.]

For the most part the somnambule is largely deprived of his normal spontaneity, although he does often exhibit some power of reasoning, and performs certain acts that meet with his approval, and refuses to do other things because he seems to realize that they are unnecessary or improper. On the whole, the dis-

criminating power of the somnambule is usually far below normal, and it can often be almost, if not completely, destroyed by repeated suggestions for this purpose, provided that the suggestions are made with discretion and the subject is positively given to understand that the thing suggested for him to do is right and proper for him under the circumstances.

Physical Effects of Hypnotism.—The cataleptic and the lethargic stages do not interest us here. Nearly all, if, indeed, not all, the altered conditions found in the organs of locomotion in hypnosis, induced by the suggestive method, are due to suggestion. If no suggestions are made the subject sits or lies as if asleep, and the limbs fall from force of gravity. If one succeeds in hypnotizing an extremely hysterical person by the suggestive method, and she be allowed to go into a cataleptic or lethargic state, then she may exhibit the phenomena common to these conditions. (See article on CATAPLEPSY.) By timely suggestions the hysterical can be prevented from exhibiting any cataleptic phenomena.

Hypnotism is divided into three stages: Catalepsy, lethargy, and somnambulism. Physiologically, the condition resembles sleep, and is caused probably by the separation of the dendrites from the nerve-cells. The hypnotic sleep is first induced by fatigue (for example, of the eye-muscles); second, by suggestion. Communication with the outer world then takes place through the ear alone. Other impressions are not perceived, and spoken suggestion therefore produces a profound effect. Dercum (*Med. News*, Apr. 7, 1900).

Nearly all the general and special sensory functions seem to be sharpened in a person while in a state of hypnosis, and those that are not affected by the hypnotic state may be increased by the proper suggestions. It is remarkable how acute

the hearing often becomes. The subject at times will be able to tell what figures or letters have been written by some one in a distant portion of the room, while the other occupants can scarcely hear the motions of the pencil.

[I have never found one who has been able to read in this manner what has been written if several words or a few lines are written in small letters. I have repeatedly satisfied myself that hearing, vision, taste, and smell are increased, especially if the suggestion is made that they will be. J. T. ESKRIDGE.]

Temperature and pressure sensations are increased by suggestion. Power to feel pain may be present unless the suggestion is made that it will be absent, although I have found it absent when no voluntary suggestion has been made.

Persons soon become fatigued on putting them to severe tests to determine the capacity of their sensory functions. I have seen patients become exhausted, manifest great nervousness, begin to sigh, the face to flush, and profuse perspiration to appear after undergoing an examination of their physical or mental powers.

In cases in which a patient, on being subjected to hypnotic influence, shows convulsive tremors, all hypnotic suggestion should immediately cease, and the subject should be awakened and advised to rest in the recumbent posture; a small amount of some gentle stimulant should also be administered. G. de Clive-Lowe (*Austral. Med. Gaz.*, Dec. 20, '97).

Psychical Manifestations in Hypnotism.—Of all the phenomena of hypnotism that of memory is the most pronounced and the most easily studied. The memory, as in the sleep-walker, or natural somnambule, is acute during hypnosis, not only for occurrences during previous hypnoses, but generally, both for the waking and sleeping states. Some persons affected with natural somnambulism remember during the som-

nambulistic state only what occurred during previous states of this condition and nothing of their normal states.

[So far as I have investigated, all persons in an artificial somnambulistic state retain a memory of all occurrences during previous hypnoses, a partial, and sometimes an accurate, memory of things that took place during their normal states. Most cases of hypnotism that I have carefully studied, unless I have made a suggestion to the contrary, have been able during their normal states to recall a few things that have been said to them during hypnosis, and as time elapses, they have, by effort, recalled much that has occurred while they were in an hypnotic state. J. T. ESKRIDGE.]

A suggestion during hypnosis to the effect that they will remember nothing that has taken place during this period causes memory to be a perfect blank after they are awakened. In like manner, if the suggestion is made during hypnosis that they will remember everything on awakening, the result will be as suggested. After the suggestion has once been made during hypnosis that nothing will be remembered on being awakened, nothing will be remembered after subsequent hypnoses until after the effect of this suggestion has been destroyed by a contrary one.

[I admit that memory is totally a blank or very imperfect in the waking state for what has occurred during hypnosis, but I have met with, as stated above, cases in which the subject could recall a few things that took place during the hypnosis if no suggestion had ever been made that nothing would be remembered. I, therefore, cannot agree with those who contend that all memory for occurrences of the hypnotic period is abolished in every case after the patient has been awakened. J. T. ESKRIDGE.]

While memory during the state of hypnosis is usually so acute and so accurate for all previous hypnoses, yet the

hypnotist has it in his power, by simply suggesting to this effect, to prevent the subject in one hypnosis remembering anything that has occurred during all previous hypnotic states. This has an important medico-legal value, and might prevent criminal acts of the unscrupulous to go undetected.

Another characteristic of the memory in hypnotism is the power unconsciously to remember things weeks, months, or probably years after they have been suggested, yet at no time during the period between the time when the suggestion was made and the moment at which the act suggested was carried out is the person able to recall the faintest idea of this latent memory; neither is he conscious that a suggestion has been made. During a subsequent hypnosis, after the carrying out of a post-hypnotic suggestion, the person is able to describe every detail in relation to the suggestion and its execution, but during the waking state nothing of it is remembered.

[I have a patient, a noted sleep-walker of this city, whom I have for a period of years hypnotized once every two or three months. During hypnosis I suggest to her that she will come to my office two or three months hence, on such a day and at such an hour and bring a friend with her. She has failed to appear at the appointed time only twice. On each of these two occasions she called me up by telephone at the time appointed for her to come, almost to the minute, telling me that she could not get anyone to come with her. I had previously suggested that she should never come to my office alone. Her friends have repeatedly asked her between these periods when she was going to visit me. Her reply has invariably been: "I don't know; when I am wanted, I suppose." J. T. ESKRIDGE.]

The power of a person in an hypnotic condition to recite passages that they had simply casually read a long time be-

fore is often wonderful. While memory is usually very acute in this condition, I have found a few persons in whom it seemed poor. All prolonged trials of memory during hypnosis are very fatiguing.

Diagnosis of Hypnosis.—It is not always possible to detect feigning. The relaxed and expressionless condition of the face, most typically seen before the hypnotist begins with his suggestions, the falling of the limbs and head by the force of gravity; the slow, labored, and jerky movements executed in carrying out suggestions are hard to simulate. A person feigning usually overdoes his part.

Dangers of Hypnotism.—So far as my reading goes there has been only one death recorded as occurring from the direct effects of the excitement incident to intense mental strain of a person in hypnosis.

[An account of the death and autopsy may be found in the *Journal of the American Medical Association* (Oct. 27, '94). The unfortunate subject was a neurotic female, who, after being hypnotized, was subjected to intense mental strain and requested to exercise clairvoyance while hypnotized. Her answers were not remarkable, considering the information given her by the operator, a non-medical man, but the strain proved too great and she collapsed and died in a few minutes. J. T. ESKRIDGE.]

Nearly all are agreed that the indiscriminate use of hypnotism or the employment of it by persons ignorant of the possible bad effects that may result from it, is highly reprehensible and should be forbidden by law. Much depends upon the methods employed to induce hypnosis. Repeated hypnosis, unless the greatest precaution is used, may result in weakening the ego of the subject. It does not seem to me justifiable to hypnotize for experimental purposes alone.

[He who resorts to hypnotism is dealing with a potent agent, and he should use it as carefully as he would a deadly poison. No one would think of giving large doses of morphine or strychnine simply to study the physiological effects of these agents upon man. If these remedies are given for their therapeutic effects, then the resulting phenomena should be studied and recorded. J. T. ESKRIDGE.]

When it is necessary to employ hypnotism for the relief of some conditions, then it is justifiable, in my opinion, for the observer to study the physical and psychical effects. The hypnotized should never be subjected to prolonged physical or mental strain. Persons should not be kept in an hypnotic condition for days at a time. When the suggestive method of inducing hypnosis is employed, the same subject should not be too repeatedly hypnotized over a long period, and every precaution should be used, by suggestion and otherwise, to prevent any ill effects. It seems to me that hypnotism is only justifiable for therapeutic purposes in a limited number of cases.

Hypnotism is apt to produce evil effects on the organism, and it especially favors and develops tendencies to hysteria. Germain Sée (*Ther. Gaz.*, Apr. 15, '90).

Hypnotism regarded in the light of a physical force, as real as the currents of electricity and as potent for good in the relief of disease. Luys (*Jour. de Méd.*, Feb. 28; Mar. 7, 13, 20, '92).

Hypnotism is a pernicious practice, in that it lessens one's power of resistance, and so degrades the patient both morally and intellectually. William James Morton (*N. Y. Med. Jour.*, Mar. 13, '97).

There is no doubt that the methods employed by Charcot and his followers—such as tiring the subject by gazing at bright objects held in such a position as to strain the eye-muscles, the sudden flashing of an electric spark before highly-hysterical subjects, frightening a

nervous person by striking a loud-sounding gong hidden near her, or stamping the floor with the foot, and in a loud and commanding voice bidding the person go to sleep—may result in great nervous and mental strain, often throwing the subject into an hysterical condition. Convulsions and insanity have followed such procedures.

As to whether some persons may possibly be hypnotized against their will, it is my opinion that these are mainly accidental cases and could rarely be used for the purpose of crime. No one can be hypnotized against his will if only the suggestive method of inducing hypnosis is employed. It is probable that after repeated hypnotic suggestions a person might be forced to commit a criminal act against his will or desire.

[A. Stodart Walker has recently detailed such a case, and says that he has met with more than a dozen experiences. J. T. ESKRIDGE.]

Case in which an innocent married woman confessed herself guilty of adultery and made a written statement of her infidelity, which was afterward repeated and amplified. The law in England requiring that the evidence of adultery must have corroboration, the evidence showed that she was simply laboring under an obsession which had its origin in the suggestion of a palmist she had consulted. Editorial (Lancet, Mar. 17, 1900).

Therapeutics.—**PRECAUTIONS NECESSARY.**—As it is difficult to hypnotize the highly nervous and intensely self-conscious by the suggestive method, it is well to refrain from hypnotizing these subjects when it is possible to help them as much by other methods. When it seems imperative to induce hypnosis in them the suggestive method, combined with staring, pressure on the head, or stroking of the body should be resorted to. In all classes of subjects hypnosis should not be induced more frequently than seems

absolutely necessary. To prevent resorting to hypnotism too often it is well at each *séance* to suggest that the impressions will be lasting, and repeated hypnotizations will not be needed or desired by the subject. The latter should be cautioned against depending entirely upon the help of another, but encouraged to assert his will and become independent. Such suggestions should be repeated in a firm voice two or three times while the patient is in a deep hypnosis. Unpleasant or exciting suggestions should be avoided during hypnosis as much as possible, and if we are forced to use any such, their effects should be counteracted by the proper suggestions before the subject is allowed to awaken. It is better, as a rule, to suggest that the patient will remember nothing of what has been said during the *séance*. We should never allow ourselves to use suggestions to satisfy a morbid curiosity, neither should we inquire into the private affairs of the patient. The subject should always be told before being allowed to awaken that nothing but good can result from the hypnosis, that nothing but proper suggestions can be followed, and that he will feel better, less nervous, and refreshed on awakening. It is safer never to hypnotize a person, especially a female, except in the presence of a third party. The suggestion should be made during each hypnosis that no one shall ever be able to hypnotize the subject against his will, and not even then except in the presence of a third person. If any delusions have been suggested during the hypnosis they should be destroyed before the person is allowed to awaken. The awakening should be done in a soothing manner. It is well for most persons, if not absolutely necessary for all, to be aroused slowly, by being told that they are gradually awakening, and

will be wide awake in a certain number of seconds, feeling quite well, without mental or physical depression.

The value of hypnotism in each individual case depends upon whether the mental impression made by the hypnotist upon the subject in the state of hypnosis is capable of removing and taking the place of another mental impression of which the subject is possessed. I believe that the therapeutic influences of hypnotism are due to suggestions which are made sufficiently strong to become more or less permanent mental impressions. The mind of every normal person is in a more or less receptive condition, the degree depending largely upon the presence or absence of disturbing influences. We are constantly, when in contact with others, making and receiving impressions. It is not necessary for us to be hypnotized to be swayed to some extent by the influence of others.

[Tuke's work is replete with examples of this fact. Probably the reason why a person in a state of hypnotism is more susceptible to suggestions than in his waking or normal condition is due to the fact that the mind is freed from all influences at the time save those of the hypnotist. J. T. ESKRIDGE.]

We should not expect too much of hypnotism. At best it permits only of making suggestions more effective for good or bad than can be done upon one in his waking state.

[Elsewhere I have said: "It seems to me that much injustice has been done hypnotism as a therapeutic agent by the extravagant claims made for it by some conscientious physicians. Whether it has or should have a place in therapeutics we must decide after giving it a fair trial. So many of the results alleged to have been obtained by hypnotism seem so exaggerated that one is led either to doubt the honesty of the hypnotist or suspect that his judgment has been warped by enthusiasm." J. T. ESKRIDGE.]

I have never seen a case in which a fixed habit of years' duration has been broken up by one or two hypnotic treatments, although many claim such a degree of success. In these cases my experience leads me to believe that repeated hypnotic suggestions extending over prolonged periods are necessary, and that even then the treatment will rarely be successful for periods of years. There will come times in the feelings of the alcohol or morphine *habitué* when the impulse to indulge is overpowering. Further, it must be remembered that scarcely any habit can be broken up by hypnotic suggestions unless the patient is desirous of getting rid of such a habit and fully co-operates with the hypnotist. The desire of the subject in his waking state and the influence of the suggestion made by the operator during hypnosis are both necessary in enabling a person to overcome such a habit as the morphine or alcohol, and even then they often fail, owing probably to the weakness of the will of the *habitué* when the temptation is at its strongest.

ANALGESIA.—Some contend that pain-anæsthesia does not occur spontaneously in hypnosis, but is the result of suggestion. Björnström seems to take it for granted that it is almost universal even without suggestion. My personal experience is that in numerous cases analgesia does not occur irrespective of suggestion, and in a few it is not complete after repeated suggestions to this effect have been made.

Were it not that we possess better and more reliable anæsthetics in chloroform and ether, hypnotism would to-day be extensively employed in surgery. It is only when the administration of an anæsthetic would be likely to be attended with danger that there is any excuse to resort to hypnotism in surgical cases.

Hypnotism recommended for operations in the mouth, as the patient is able to swallow the blood, and thus escapes the danger of its falling into the respiratory passages. Forel (*La Semaine Méd.*, Aug. 14, '89).

Case of a patient who, under the influence of hypnotism, was operated upon with the most satisfactory results. It was a case of osteomyelitis in the upper third of the humerus, and required a painful surgical operation. Three days before the operation the patient was hypnotized six times, and was very well under control by the proper time. Edward L. Wood (*Med. Record*, Jan. 4, '90).

Hypnotism is of great value in children, and also in dental operations. In operations of some gravity, however, the fear of the patient outweighs any other influence, and hypnotism does not succeed. Osgood (*Internat. Dental Jour.*, June, '93).

FOR THE RELIEF OF LABOR-PAINS.—Hypnotism has been employed by a number for this purpose. It is a very uncertain agent in these cases unless the subject has been hypnotized before labor begins. This often requires considerable time and patience, and a few inhalations of chloroform answer the purpose much better.

After employing hypnosis on thirteen patients in labor, the conclusion reached that hypnotism, is an uncertain and inefficient anæsthetic, and produces a decided diminution in the force of the uterine contractions. Auvard and Secheyron (*Archives de Tocologie*, Nos. 1, 2, 3, '88).

ORGANIC DISEASE.—I have employed hypnotism in the treatment of organic diseases only in a few instances, and then on the earnest solicitation of the patients or their friends. Nothing further was expected in the treatment of these cases by hypnotic suggestion than the relief of certain symptoms, such as pain and despondency and the improvement of the organic functions. In some instances despondency has been replaced by hope,

pain assuaged, if it was not acute; sleep induced, the bowels regulated, and appetite and digestion improved. I must confess that I have seen very few cases of organic disease in which more was accomplished by hypnotic suggestion than could have been attained by other and less troublesome means.

[I have met with one case of cervical pachymeningitis of several years' duration in which pain and sleeplessness have been relieved for a period of nearly three years, although the patient was hypnotized only six or seven times. J. T. EsKRIDGE.]

The presence of the physician who inspires his patient with confidence and hope is a constant suggestion that health will be restored.

Hypnotism and suggestion are useless in organic cerebral and spinal disease. Danillo (*St. Louis Med. and Surg. Jour.*, June, '89).

Out of 29 cases of organic disease of the nervous system, treated by hypnotic suggestion, only one cure was obtained, and that was doubtful. Pain and other symptoms may, however, be relieved. Van Reeterghem and Eeden (*Clin. de psycho-thérapie suggestive. Compte rendu des résultats obtenus pendant la première période bisannuelle*, 92 pp., gr. 8, '89).

Case of *tabes dorsalis* treated by daily hypnotism for about three weeks. In addition to local anæsthesia and partial loss of sight, there were severe pains in the chest and back, obstinate constipation, inability to walk more than half a mile, loss of appetite, insomnia, and great mental depression. The patient was hypnotized, and suggestions were made as to the bowels, digestion, sleep, and pains, the parts at the same time being gently rubbed. The following day the bowels were moved naturally for the first time in three months. After three weeks of treatment the patient's habits had greatly improved. The relief continued until the time of writing the report (about four months), although the disease probably progressed. Tuckey (*Lancet*, Aug. 24, '89).

Case of a man suffering with an advanced stage of disseminated sclerosis of the cord was so benefited as to be enabled to leave the hospital. The diagnosis was verified, as the patient returned within a year and died of tuberculosis. Fountain and Sigaud (*Lancet*, Aug. 24, '89).

Case of infantile hemiplegia observed, in which improvement was produced after hypnotization for three months. The author believes that every person capable of displaying functional nerve-disturbance may be successfully hypnotized, and his experience led him to consider hypnotic treatment for organic lesions unsuccessful. J. H. Whitham (*Brit. Med. Jour.*, Feb. 28, '91).

FUNCTIONAL DISORDERS.—Gastro-intestinal disorders of a functional character may be temporarily and in some instances apparently permanently improved by hypnotic suggestion. At the suggestion of the operator the appetite increases and digestion improves.

[I have not undertaken to treat many of these cases by suggestion, and those that I have were mostly inmates of the County Hospital. The improvement in most instances was only temporary. When the loss of appetite and impaired digestion depended upon functional nervous states the effect of treatment was better. J. T. ESKRIDGE.]

It is easy by suggestion to cause the bowels to move at will, and often they will move at regularly suggested periods for days subsequently; but repeated suggestion from time to time is necessary to prevent a return to a constipated habit. Hypnotism is of little value in breaking up a costive habit except in those cases in which the habit is of short duration and due simply to a neglect to obey the calls of nature.

All the functional disorders of the nervous system do not improve by hypnotic suggestion. I have never succeeded in improving the condition of a typical hysterical subject by means of

hypnotism, mainly from the fact that I have refrained from using any method to induce hypnosis in this class beyond the suggestive method, and none have become thoroughly hypnotized. Many experimenters—among whom may be mentioned Van Reeterghem, Eeden, Bidon, Stembo, Sperling, Bernheim, Danillo, Moll, Strübing, Mendel, Briand, Ringier, and others—report success in the treatment of a number of their cases of hysteria by means of hypnotic suggestion. What method they employed to hypnotize this class of their patients is not stated. Danillo acknowledges that most of his cases have relapsed after they had been helped or cured.

Those cases of hysteria in which the symptoms are many and quickly changing are less amenable to treatment than those cases in which there is some single severe symptom. Sperling (*Deut. med. Woch.*, Oct. 31, '89).

In 40 cases of severe hysteria and other neuroses, 9 were completely cured and nearly all improved. In 164 slighter neuroses, 47 were cured, 37 markedly improved, and 39 slightly improved. Van Reeterghem and Eeden (*Clinique de psycho-thérapie suggestive. Compte rendu des résultats obtenus pendant la première période bisannuelle*, 92 pp., gr. 8, '89).

Two severe cases of imaginary disease reported cured by suggestion. Both cases occurred in women: one of these imagined that she had paralysis of the legs, through paternal inheritance, and for nine years was actually confined to bed and chair, from a supposed inability to walk. After so long a period of imaginary suffering, *one* single suggestion was sufficient to effect a cure. The other patient imagined that she had a tape-worm, and was cured when she was made to expel the imaginary animal. William B. De Wees (*Kans. City Med. Index*, Feb., '91).

Of three hundred cases observed more than one-third were hysterical. The author had good results in almost all from the use of hypnotism. It is indi-

cated (1) in the spasmodic attacks of grave hysteria and the paralyses following; (2) in monosymptomatic hysteria; (3) in ordinary hysteria; (4) in hysterical insanity. Bérillon (*Wiener klin. Wochn.*, No. 4, '92).

My personal attempts favorably to influence epilepsy have been a failure, and this is in accord with the experience of others. I have had no experience in the treatment of chorea or paralysis agitans by hypnotism. Some report good results, but I suspect that the effect is temporary.

Functional neuroses of all kinds are favorably influenced by suggestion. The nervous disorders of writers and artisans yield in a short time, epilepsy and paralysis agitans excepted. Mental diseases are not at all, or but very little, influenced by suggestion. Alcoholism is. Suggestion can be used in various diseases for which one can find no adequate cause, as in insomnia and a great many pains. By producing local anesthesia of the skin, one can do minor operations. Neurasthenic conditions in the sexual sphere are markedly benefited by suggestion. Louis Lichtschein (*Med. Record*, May 2, '96).

I have seen a few cases of stammering greatly benefited by suggestion, but they have all relapsed. Insomnia yields quite readily to hypnotic suggestion if the subject is easily hypnotized. Repeated hypnoses are necessary for the relief of sleeplessness, and relapses are common. I have never seen any permanent benefit result to the neurasthenic. They are difficult subjects to hypnotize and the hypnosis is rarely profound. Neuralgia of a mild form and headache may be relieved in good subjects, but no permanent results are obtained without the removal of the causes. I have tried in vain to relieve severe odontalgia and trigeminal neuralgia. Others claim great success.

In neuralgia the writer affirms that he has effected a permanent cure in about

10 per cent. of the cases treated by hypnotic suggestion. W. C. Delano Eastlake (*Med. and Surg. Reporter*, Sept. 5, '91).

Hypnotic suggestion practiced nearly fifteen hundred times, usually with very marked success. In various functional nervous disturbances, hysteria, insomnia, neuralgia, headaches, and in morbid mental states bordering on insanity decided benefit has followed its use. Frederick H. Gerrish (*Boston Med. and Surg. Jour.*, July 21, '92).

Case of mydriasis cured by hypnotism. It was unilateral and disappeared after seven sittings. Three months later the other eye presented the same condition and was cured in the same way. Booth (*Amer. Med.-Surg. Bull.*, Nov. 1, '95).

Hypnotic suggestion acts upon specific cases of either pain or disability which depend upon morbidly persistent organic memories of pain or disability. Mary Putnam Jacobi (*N. Y. Med. Jour.*, Apr. 9, '98).

INSANITY.—I have never succeeded in hypnotizing an insane person. Voisin, of Paris, professes to have hypnotized about 10 per cent., and asserts that good results have followed in some instances.

VICIOUS HABITS IN CHILDHOOD AND YOUTH.—A few years ago I had had no experience in the treatment of these cases. During the past three years I have hypnotized several of these subjects. The apparent permanent benefit in nearly all, except in those in which brain-power was very deficient, has been encouraging. Habits of lying, stealing, and masturbation have been broken up. I have repeatedly hypnotized all these subjects.

Hypnotism advocated as a means of correction and education for the vicious and depraved, especially the young. Twenty-two cases tried; 4 failures, 8 improvements, and 10 cures. Liébault (*Revue de l'Hypnotisme*, Jan., '89).

Case of sexual perversion cured by suggestion. Schrenck-Notzing (*Jour. of the Amer. Med. Assoc.*, June 21, '90).

Hypnotism is a powerful therapeutic

agent in the treatment of onanism, spermatorrhœa, and various forms of impotence. Persistent erotic dreams banished in a single lady of 20 by this means after the sixth *séance*. Victor v. Gyurkovechky (Wiener med. Presse, No. 47, '92).

Hypnotism may be of inestimable service in the moral education of backward children. Brunberg (L'Hypnotisme, jugé par les Spécialistes, '93).

Four hundred and twenty-two cases treated by hypnotism with good results, the best effects being observed in diseases accompanied by pain. Treatment regarded as of great value in correcting vicious habits in children. Henry Hulst (Med. Record, Mar. 4, '93).

[C. L. Tuckey reports success in the treatment of such a subject with a bad heredity. J. T. ESKRIDGE.]

THE ALCOHOL AND DRUG HABIT.—

Although persons belonging to these classes ordinarily afford fair results, yet there are many discouragements and failures in their treatment by hypnotic suggestion. The subjects of these habits, except possibly the cocaine *habitué*, who is generally too nervous to become thoroughly hypnotized, are usually easily hypnotized, and for a prolonged period at first find little difficulty in following suggestions. One of the essential conditions for these subjects to be benefited by the treatment is for them to have a strong desire to break off their vicious habits. Suggestions made contrary to their desires have little or no effect. The dipsomaniac is least influenced by hypnotism. In one instance of this class, however, I have apparently succeeded in getting rid of the inordinate desire for alcohol.

[Formerly, this patient was one of the worst dipsomaniacs that I have encountered. After treating him for nearly two years, and succeeding in lessening his bouts from ten or twelve to three or four a year, I then adopted the plan of suggesting to him that when he wanted alcohol he would ask his wife for it and

drink at home. At the same time I suggested that he would drink nothing but beer and would not want more than one or two glasses of this, as he would feel nauseated, and would vomit. He now asks his wife for beer once or twice a month, takes one or two glasses, becomes very sick, but does not vomit. Subsequently the patient went to a saloon and began to drink, but he began to vomit and became so sick that he had his wife telephoned for to take him home.

In a number of cases I have succeeded in making the *habitués* vomit every time that they have taken alcohol in any form. J. T. ESKRIDGE.]

I have been able in a number of instances to remove slight functional menstrual disorders in subjects that were easily hypnotized.

I have had no experience in treating nocturnal enuresis by suggestion. Others report success with these cases.

J. T. ESKRIDGE,
Denver.

HYPOSPADIAS. See URINARY SYSTEM, SURGICAL DISEASES OF.

HYSTERIA.—Gr., *ὑστέρα*, the womb.

Definition.—Hysteria is supposed to be a functional psychoneurosis due to a morbid condition of the cerebral, spinal, and sympathetic nerve-apparatus, but apparently involving primarily the cerebral cortex, and is characterized by mental, motor, sensory, vasomotor, and visceral disorders.

Varieties.—A sharp distinction must be made between hysterical manifestations and the disease known as hysteria. The fact is that all human beings and many of the lower animals may at some time, under peculiarly-trying circumstances, exhibit some of the manifestations commonly observed in hysterical subjects. A failure to draw a line of de-

markation between *hysteria* and the accidental manifestation of the symptoms of the disease accounts for much of the differences of opinion in regard to the frequency of the morbid process. Some authors, and not a few neurological specialists, seem to regard hysteria as a comparatively frequent disease. My experience has taught me that the more carefully one studies his cases and the more patiently and thoroughly he examines into each symptom and analyzes it, the less frequently he meets with genuine cases of hysteria. A person sustains an organic lesion of some portion of the body, and during the progress of the disease manifests many hysterical symptoms, but after recovery from the organic disease there are no more hysterical symptoms. This is not hysteria, but the symptoms of it are the epiphenomena which have been added to the symptoms of the organic lesion. I have come to limit hysteria to those persons who, having a predisposition to the disease, develop its symptoms. Such a predisposition is more commonly inherited, but it may be acquired. For hysteria to become a disease the symptoms must be more or less continuous, usually remittent in character and frequently attended by paroxysms. Excluding all those cases in which hysterical manifestations are but the epiphenomena of other morbid processes, I have found *true hysteria* very infrequent in the adult and still less common during childhood.

Symptoms and Diagnosis.—Multiplicity and variability characterize the symptoms of hysteria. There is not an organ of the body the functions of which may not be deranged in this disease. The symptoms may be as numerous as those that may arise from the perverted functions of every organ of the body. Fortunately no one case presents even the

majority of the symptoms of hysteria. There are, however, certain classes of symptoms which characterize the disease, both during the paroxysmal and interparoxysmal stages, although only one or many of these are present.

Hysterical children often only manifest the mildest symptoms of the disease, unless subjected to some severe physical or psychical influence. They may remain emotional, oversensitive, depressed, show lack of the ordinary self-control, and yet manifest no distinctive stigmata of the disease for years. Indeed, the disease may never become developed in them, but by proper education and fortunate circumstances they seem to overcome, to a great extent, their natural tendencies to become hysterical. Many adults go through life burdened by the psychical soil of hysteria, but never develop the disease in a typical manner because they have never been subjected to causes sufficiently strong to overcome their power of resistance.

For convenience of study the symptoms of hysteria may be divided into two classes: (1) the interparoxysmal, which are more or less continuous and constitute the stigmata of the disease; and (2) the paroxysmal. The interparoxysmal symptoms may be studied under the following headings: Psychical, sensory, motor, and vasomotor.

PSYCHICAL SYMPTOMS.—These vary with the individual temperament of the patient, and are always present to a greater or less degree in every hysterical subject. Such a person seems defective in will-power, although Sachs observes that the will is more misdirected than weakened. The impulses of inclination are followed regardless of thought or reason. There is an increased impressionability and suggestibility; so that conscious impressions are more numer-

ous than in health and suggest to the patient all kinds of fancies, whims, caprices, and perverted actions. In the worst cases self-control is lost, and, in all, it is impaired. The patient is irritable, unduly sensitive, and is annoyed by trifles. Self-consciousness is increased, trifles are magnified, the patient becomes emotional, and is easily elated or depressed, laughing and crying alternately without any apparent cause for either. The tendency to become discouraged and despondent is almost as great in some cases of hysteria as it is in melancholia. Some are painfully conscious of the action of every organ in the body. Every subjective sensation suggests the idea of a dreaded disease of this or that organ. Let an idea be suggested to the patient, especially if it relates to some physical or mental disability, and the thing suggested will likely follow. Thus we may often account for the presence of pain, paralysis, contracture, spasm, disturbance in sensation, and for various visceral derangements, especially of the heart, stomach, and kidneys. A multiplicity and variability of various kinds of subjective sensations are characteristic of hysteria, such as are rarely ever due directly to organic disease. We must remember, however, and too great stress cannot be laid on this fact, that we may encounter organic lesion of the nervous system and hysteria associated in the same person, and that in many such cases the pronounced symptoms of the latter will obscure the less obtrusive evidences of the former, unless a careful search is made for them.

SENSORY SYMPTOMS.—Sensation may be abolished, increased, or perverted in various ways. The special senses are commonly affected when general sensation is involved. The general sensory disturbances may be classed as anæsthe-

sia, hyperæsthesia, and paræsthesia. The special senses, except tactile sense, will be considered in a separate section.

Anæsthesia, next to hyperæsthesia, in some form is the most common sensory disturbance in hysteria. Few, if any, will indorse Gendrin's claim that in every case of hysteria, from the beginning to the termination of the malady, general or partial anæsthesia exists.

[On examining 400 cases of hysteria Briquet found some form of anæsthesia in 240. J. T. ESKEIDGE.]

The anæsthesia may be complete for all forms of sensation, it may affect one or more of the sensations, or there may be a simple lessening of cutaneous sensibility. It may extend over the entire body (extremely rare); it may involve one side of the body, hemianæsthesia (the most common form); the whole cutaneous surface may be anæsthetic except a few isolated areas; one or two limbs may be anæsthetic, the trunk escaping; sensation may be lost in an arm from the finger-tips to the elbow or to a point just below it (glove-anæsthesia); one leg may be similarly affected as high as the knee (stocking anæsthesia); or various anæsthetic spots or zones may be found in different portions of the body. Loss of tactile and pain senses is common. It is rare to find heat-sense alone absent. The power of localization is frequently lost when tactile sense is disturbed. Muscular, joint, and pressure sensations are infrequently entirely lost, except in those cases in which all forms of sensation are abolished. It is extremely rare that some response cannot be obtained by the application of a wire brush attached to a faradic battery. Analgesia of all tissues, skin, bone, muscle, and nerve, is sometimes found. Tactile anæsthesia of the skin and mucous membranes is not uncommon in hemi-

anæsthesia and total anæsthesia, although in these cases sensation is often partially or almost completely preserved around the anus, over the labia, to a less extent over the nipples, and immediately around the mouth and eyes. In hemianæsthesia the special senses of the corresponding side are often affected.

[According to Briquet, hemianæsthesia is much more frequent on the left side than on the right, the proportion being seven to two. J. T. ESKRIDGE.]

Hysterical anæsthesia is purely psychical; its characters are those of anæsthesia produced by suggestion. It is much more frequent than authors have admitted. It is often developed or is completed artificially by unconscious, medical suggestion, or imitation. It is always amenable to psychotherapy; but the latter is often difficult on account of the autosuggestive resistance of the subject. It may have an organic origin,—peripheral or encephalic vasomotor constriction or paralysis,—but, the anæsthesia being preserved by autosuggestion, the vascular trouble disappears. Organic hemianæsthesia of cerebral origin by lesion in the neighborhood of the sensory decussation may survive the lesion and be preserved by autosuggestion. Sensory impressions in psychical anæsthesia are collected and impress the consciousness. But the mind, stimulated by the idea of anæsthesia, inhibits and effaces the sensation as well as the collection, by forgetting it. Bernheim (*Revue de Méd.*, Mar. 10, 1901).

The following are the most important diagnostic features of anæsthesia of hysterical origin:—

1. In hemianæsthesia the loss of sensation is often profound, extending from the crown of the head to the sole of the foot.

2. The reflex action of the skin over the anæsthetic area is normal, or nearly so.

3. The pupils dilate when the skin of the neck on the anæsthetic side is irritated.

4. The fingers of the anæsthetic hand can still be used, without the aid of sight, in the performance of fine and dextrous movements.

5. When the arm or leg is affected the anæsthesia may cease abruptly at the shoulder or hip, or at the elbow or knee.

6. The ovarian tenderness is often greater on the anæsthetic side. The other tender spots on the affected side usually persist, notwithstanding that analgesia over all other portions of this side is profound.

7. The loss of sensation may extend up to, or just beyond, the middle line in front, but may not reach the median line on the back.

8. The anæsthesia may come on suddenly as from traumatism; it may develop or increase after an hysterical paroxysm; it may increase during the examination or at the menstrual period; it is often changeable from day to day, and may be transferred from one side to the other.

9. The anæsthetic area ends abruptly. (The same thing is found in some cases of syringomyelia.)

10. In hemianæsthesia there is frequently a condition of "crossed amblyopia," the affected eye being on the side on which sensation is lost.

Hyperæsthesia and *hyperalgesia*, to a greater or less extent, are probably present in nearly every case of hysteria. The rarest form is in those cases in which there is an increased cutaneous sensibility over nearly the entire body. The next rarest form is unilateral hyperæsthesia. Commonly in cases of almost general bilateral or unilateral hyperæsthesia there are small areas of anæsthesia. The most common form of hysterical hyperæsthesia and hyperalgesia is that in which sensitive areas or points are found in various portions of the body.

These have been termed "hysterogenic zones," because pressure over these points will often excite a convulsion or may cause it to stop if the pressure is made after it has developed. The sensitive points are usually found over the ovarian region, usually the left; in the left hypochondriac region; over the lower portion of the ribs; over the breasts, more commonly the left; the upper front portion of chest; on top of the head; on each side of the spinal column, and sometimes over various portions of the spine. Frequently numerous superficial sensitive points may be found over the abdomen, or the entire abdomen may be acutely sensitive to superficial pressure. In some cases the skin over the entire spinal column may be so acutely sensitive that the slightest touch causes the patient to cry out with pain. Spontaneous pain is often complained of in the intercostal spaces, over the heart, and over the entire spine, including the coccygeal region. In some cases the pain radiates up the cervical region of the spine over the back of the head. This symptom is very common in traumatic hysteria. The organs of special senses do not escape. Headache is a common and very distressing symptom in hysteria. The vertex is the most frequent seat of the pain, although it may be located in any other portion of the head, especially in the occipital, suboccipital, the temporal, or frontal region. Painful joints and neuralgic pains in various portions of the body are common in hysteria.

Hysterical arthropathy has sometimes led to unnecessary amputation. Intense pain and even swelling, and a light form of genuine arthritis, may be present. The excessive tenderness of the skin is an excellent diagnostic point. Anæsthesia is of great use in clearing up an obscure case. Those cases recover best in which no local treatment is adopted.

Charcot (Jour. de Méd. et de Chir. Prat., July 10, '91).

The following are diagnostic points in hysterical hyperæsthesia:—

1. The areas of increased sensitiveness are often ill defined, changeable, and may be bordered by areas of anæsthesia.

2. In hemianæsthesia the deep-seated tenderness, or hysterogenic points, are most marked on the side corresponding to that on which sensation is lost.

3. When the pain or tenderness are superficial, deep and steady pressure, especially over the spine or abdomen, may give a sense of relief, after the excitement caused by the contact of the hand has passed away.

4. The painful joints may show no local changes, nor any other evidences of organic disease, and the patient is very averse to the slightest movement of the affected joint.

5. The presence of other stigmata of hysteria.

Paræsthesia.—Numbness is a common form of disturbed sensation in hysteria. This is often attended with "pins and needles" sensation. The skin may tingle or burn, or there may be a sensation of pricking. Some complain of a feeling likened to worms or other insects crawling under the skin. Others are troubled with a sensation as though water were being poured down the back, or allowed to drip drop by drop on the spine. The scalp and the brain are frequently the seat of all kinds of subjective sensations. Each organ of the special senses may apparently be the seat of perverted sensations, peculiar to the function of that particular organ. Paræsthesia may affect only one side of the tongue if it is unilateral in character.

The only diagnostic point to be gained by a study of paræsthesia of hysterical

origin is that organic disease never gives rise to such a variable multitude of symptoms, especially of the character of those above mentioned.

The Special Sense-organs.—The eyes may be affected in various ways. They may be the seat of neuralgic pains. They may be so acutely sensitive that the patient is apparently unable to have her room lighted without having her eyes covered. Hyperæsthesia of the retinae is frequently increased by the attending physician allowing the patient to remain in a darkened room. A careful study of the vision, color-perception, the fields, and the action of the irises should be made in every case of hysteria. Total blindness of one or both eyes is exceedingly rare. The loss of sight comes on suddenly after a fit or a mental or physical shock. While the patient does not consciously see, and acts accordingly, yet by the proper tests it can be demonstrated that vision exists. Great care is required in distinguishing these cases from those of feigned loss of vision.

Three cases in which complete loss of vision in one or both eyes occurred without the presence of fundus changes or lesions of the optic nerve or brain, as far as could be detected, to account for it. Restoration of function occurred in all the cases. Alvin A. Hubbell (N. Y. Med. Jour., July 17, '97).

"Crossed amblyopia" is more common than amaurosis. In this condition in hysteria the vision is very slight and the fields are narrowed in the eye corresponding to the anæsthetic side of the body. In the opposite eye vision is lessened and the fields are impaired. The fields for perception may be lessened in three different ways: There may be bilateral homonymous hemianopsia (the blind fields on the right or left half of each eye, etc.); a central blindness (central scotoma); or a concentric narrowing of

all the fields (the most common defect). Bilateral homonymous hemianopsia in hysteria is exceedingly rare, and the majority of careful observers have never seen a case. A sufficient number, however, has been reported, by most excellent investigators, to demonstrate the possibility of its occurrence from functional cerebral disturbance. As found in hysteria, it has features which distinguish it from the cases that have an organic origin. It comes on suddenly, is usually transient, it involves the half of each field corresponding to the anæsthetic side of the body, with both conjunctivæ anæsthetic, and the other halves of the visual fields are greatly narrowed. The cases of hysteria presenting central scotoma show no changes in the retinae. Concentric narrowing of the visual fields is frequent in hysteria, and this may take place to so great an extent that only extreme central vision remains.

"Hemiopia" may accompany ophthalmic migraine of hysterical origin, but in these cases it is always transitory, as is the migraine, and appears to be due to a temporary exaggeration of the concentric narrowing of the visual field. Gilles de la Tourette (*Annales d'Ocul.*, Oct., '91).

Color-perception is often greatly changed from the normal in hysteria. There may be a complete loss of color-perception, — achromatopsia; or there may be simply a disturbance of this, — dyschromatopsia. In the former condition everything has a grayish appearance, with an inability to distinguish one color from another. Dyschromatopsia is the more common defect. The normal color-fields from without inward are as follow: Blue, yellow, red, green, and violet. Thus, blue is the largest and violet the smallest. In hysteria red and blue may change places, so that red occupies the largest field. In narrowing of

the color-fields the colors at first disappear in the order of their normal position, those occupying the smallest fields being obliterated, or "squeezed out of the centre" first. Violet is the first to disappear, then green, but red remains, and is said to be the most persistent color in hysteria.

The fields, both for objects and colors, may remain entirely normal in hysteria.

Monocular diplopia is not peculiar to this disease, as it occurs from organic disease of the brain. Hippus, or contraction and dilation of the pupils irrespective of light, has little diagnostic significance, as it is found in various depressed conditions of the nervous system. It should be borne in mind that the pupillary reflex is normal in hysteria, even in the cases of blindness or hemianopsia. Like the eye, the other organs of special sense are usually affected on the anæsthetic side.

Possible disturbances of the ocular muscles that may occur in hysteria are:

(1) disassociation of the movements of the eyes; (2) paralyses, which may affect individual muscles or associated groups of muscles; (3) contractures, which may affect individual muscles (spastic squint), associated groups of muscles (conjugate deviation), or both internal recti (convergent squint); (4) strabismus concomitans; (5) nystagmus; (6) conditions of paralysis or contracture of the muscles of accommodation; (7) conditions of paralysis or contracture of the muscles of the lids (blepharospasm, nictitatio, ptosis pseudoparalytica, etc.). Kunn (Wiener klin. Rund., Nos. 22, 23, 25, '97).

Points in the diagnosis of hysterical eye affections:—

1. If vision is lost or greatly lessened the patient acts as though she does not consciously see, yet by the proper tests it may be demonstrated that she does see.

2. In "crossed amblyopia" the worst eye is on the side corresponding to that on which the anæsthesia is situated, with or without paralysis or contracture, but the face is not paralyzed.

3. In homonymous hemianopsia both cornea are anæsthetic.

4. In dyschromatopsia blue may disappear before red.

5. In achromatopsia everything appears gray.

6. The presence of other stigmata of hysteria.

Hearing in some cases becomes so acutely sensitive that the patients are annoyed by ordinary sounds and by conversation. Unilateral deafness may occur alone, but it is oftener in association with affection of the other organs of special sense of the same side, which corresponds to the anæsthetic side. The deafness may be transferred to the opposite ear, with the transference of the anæsthesia to the opposite side of the body. The auditory canal and tympanum are anæsthetic. The loss of hearing is not always complete. The auditory nerve loses its normal irritability to electrical stimulation. Lloyd is in error in concluding that because the tuning-fork in hysteria can be heard better by aerial conduction than by bone-conduction it is a proof that the loss of hearing is psychical.

[The fact is that we can normally hear the vibrations of a tuning-fork through the air better and longer than we can through the bones of the head (Rinné). J. T. ESKRIDGE.]

The transference of the deafness from one side to the other by suggestion, the absence of evidence of ear disease, and the presence of other stigmata of hysteria are important aids in the diagnosis.

Smell and taste may be increased, lessened, or abolished on the side corre-

sponding to the anæsthetic side of the body.

MOTOR SYMPTOMS.—Paralysis in some forms is not infrequent in hysteria. Probably the most common form is paralysis of the adductors of the vocal cords, producing aphonia. The paralysis may affect a few or many muscles. It may take the form of a monoplegia, hemiplegia, a paraplegia, or there may be almost a total paralysis, except of the face-muscles. It is often associated with contracture and anæsthesia. In many cases contracture is absent. When the paralysis takes the form of hemiplegia there may be hemianæsthesia, affecting all the special senses on the paralyzed side. In some cases of hemiplegia the anæsthesia is segmental in character. In monoplegia, if anæsthesia is present, it affects the entire paralyzed part or its distal portions. The same rule holds good in paraplegia. In hemiplegia the arm is usually affected to a less extent than the leg. The face is probably never paralyzed in hysteria as it is in hemiplegia from organic brain disease.

Ptosis of hysterical origin occurs occasionally, but it is not due to paralysis of the levator muscle. Paralysis may affect the tongue, pharynx, larynx, and œsophagus. Lloyd adds: "And even the anus"; but Gowers states that incontinence of urine or fæces never occurs. The paralyzed leg, when the hysterical patient is able to walk, is dragged as a heavy and almost useless limb. The paralysis is excited by trauma, a fit, or by some emotional disturbance.

Henrot first drew attention to the frequent absence of the pharyngeal reflex in cases of hysteria,—i.e., emesis or retching after physical irritation of the pharynx failing to occur. Since then various observers have arrived at varied conclusions. Kattwinkel found it absent in 100 out of 104 cases, and regards

it, as also does Chairon, as almost pathognomonic; Thaon, *per contra*, in only one-sixth of his cases; Engelhardt in 3 out of 10 hysterical patients, in from 25 to 26 per cent. of 200 persons free from nervous affections, 17 per cent. in addition presenting weakened response. Stursberg examined 40 males and 83 females suffering from hysterical symptoms with regard to the response to stimulation of the pharynx. In none of the males and only in 14 of the females (16.8 per cent.) could no reaction be elicited. In 67.4 per cent. of the total number of both sexes the reflex was normal, in 1.6 per cent. exaggerated, in 19.5 per cent. decreased, and in 11.3 per cent. lost. No constant relationship between presence or absence of the reflex and of the area of the hysterical symptoms could be established. Stursberg (*Münchener med. Wochen.*, April 15, 1902).

Aphonia of hysterical origin usually comes on suddenly and spontaneously, so far as we are able to judge. The usual exciting cause is some emotion or a catarrhal condition of the larynx. The patient is able to whisper if the tongue is not involved, but when it is paralyzed voluntary articulation is lost. Such patients are often able to sing, and may talk aloud in their sleep, or while under the influence of an anæsthetic, yet be unable to utter a distinct articulate sound voluntarily.

Power in the limbs is rarely absolutely lost. The patient may be able to move the limbs in bed, but as soon as the erect posture is assumed the legs may give way at the knees. If the patient is able to walk the gait is shuffling, the steps short, but the front portion of the foot does not drop as in paralysis of organic origin.

On testing the strength of the weakened muscles in hysteria the extensor muscles contract more than in health, and this gives to voluntary muscular movements the appearance of the pa-

tient intentionally resisting the force of flexor contraction. If the patient is requested to grasp the dynamometer with all her power the muscles on the back of the arm can be seen to contract, causing an irregular and jerky movement of the hand.

The nutrition of the muscles is well maintained considering that the muscles are not used. Electrical reaction is practically normal. In all cases in which the reactions of degeneration are found present there is some organic change in the nervous system to account for the phenomena. Gowers states that muscular irritability is normal in one-half the cases, but that it is slightly increased in cases in which spinal tenderness is present. In this condition the knee-jerks are excessive, and on tapping the patellar tendon the trunk-muscles contract and the patient experiences a sharp pain in the lower portion of the back. These phenomena I have seen especially well marked in cases of traumatic hysteria. The knee-jerks may be lessened, but they are rarely ever entirely absent. In those cases in which they seem to be absent they may be elicited if the precaution is taken to see that the flexor muscles of the knees are not contracted. True ankle-clonus is rare in hysteria except in cases in which the heel is drawn up by chronic contracture of the calf-muscles. Spurious ankle-clonus is not infrequent. On first pressing the foot upward there may be one or more slight, irregular movements of the foot; they cease, and in a few seconds begin again, but can be prevented by firm and continuous pressure of the foot upward.

True ankle-clonus is exceedingly rare in hysteria, but it does occur. I have been able to obtain it during the convulsion and in some cases of contracture of the calf-muscles.

The plantar reflexes are often slight or entirely absent in hysteria. The other superficial reflexes may be present or absent on the paralyzed side. No bed-sores form even in the bedridden cases.

Contracture frequently occurs in connection with paralysis of hysterical origin, but it may develop independently of it. The causes are usually those that give rise to paralysis. It may last minutes, hours, months, and in some cases even many years. The degree of contracture gradually increases after its beginning, although the condition developed suddenly. The nutrition of the muscles is not materially interfered with except in those cases in which the contracture is extreme and of prolonged duration. The opposing muscles of the contracted group are tense, so that the affected joints are held as in a vice (Lloyd). Sensation is often lost in the skin over the affected muscles or in the distal portions of the limb. In cases of contracture of the arm, leg, and face of the same side, there may be a condition of hemianæsthesia of the affected side, the face being turned toward the anæsthetic, paralytic, and contracted limbs. The anæsthesia in these cases usually involves the entire side of the body from the sole of the foot to the crown of the head. The special senses of the same side do not escape. Of the limbs, the arms are more frequently the seat of contracture than the legs. One or both arms may be affected. The hand, the wrist, or the entire arm may be involved. The contracture in the arm is flexor in character. The finger-nails may be buried in the palms of the hand, or the fingers may be flexed at the metacarpophalangeal joints and extended at the other joints, as in tetany. This is the only exception from the rule of flexor contracture in the hands and arms

in hysteria. The flexor contracture of the hand is not lessened by forcibly flexing the wrist, as is the case of contracture from organic trouble. In the legs, whether one or both are affected, the contracture is extensor in character, except that the toes are flexed. The heels are often pulled upward to such a degree by the calf-muscles that the dorsum of the foot is on a line with the front of the tibia. The feet are rigidly extended at the ankles, and the legs at the knees and hips. Contracture is said to involve one side of the face in some cases. I have never seen a case with hysterical contracture of all the muscles of one side of the face. Temporary contracture of the eye-muscles, producing strabismus, I have met with in a few cases. Contracture of the tongue-muscles occurs. The muscles of one side of the neck may be so affected as to produce a condition of torticollis. Contracture of the obicularis palpebrarum muscles may produce a pseudoptosis. This may be unilateral or bilateral. Sometimes the diaphragm is affected. In some cases a part of a muscle may be the seat of contracture, giving rise to the appearance of a tumor. Such pseudotumors have been observed in the calf, pectoralis major, and abdominal muscles.

Two forms of hysterical contracture exist, as follows:—

1. One concerns single parts and limited groups of muscles, and may last for years without organic change in muscles, joints, or interstitial tissues. In this form also sudden cessation of contracture is possible.

2. A form which attacks in succession one limb after another until nearly all voluntary muscles, including those of the trunk, may be affected.

These never get well abruptly, and in them muscles, joints, and areolar tissue undergo serious organic changes. In the first form the muscle-reflexes and me-

chanical and electrical reactions are but little changed, while in the generalized form late in the disease the reflexes are diminished or lost and the quantitative electrical reactions are decreased. It is only in this form, after years of life in bed, that changes in the cord are to be expected, and whether these are independent accidents or secondary products of the hysterical condition is not definitely known. S. Weir Mitchell (*Revue de Chir.*, Aug. 24, '95).

Ataxia.—Ataxia in hysteria is pronounced in some cases. It is usually greater than what is observed from organic disease, and the movements that the patient makes to maintain the upright posture are greatly exaggerated. Astasia-abasia, occasionally observed in hysterical subjects, is an inability to stand or walk, although the limbs are strong and can be moved freely in all directions while the patient is sitting or reclining. Choreoid movements of the hands, arms, or of different groups of muscles are often seen, especially in children or young adults. One shoulder is suddenly drawn up or the head is jerked to one side, backward, or forward. Sometimes the movements are shock-like in character. I have witnessed one case of hysteria in the male in which, on the patient's attempting to stand or walk, he would spin around like a top until he fell. Rhythmic or oscillatory movements of the head, trunk, or limbs sometimes occur in hysteria.

Tremor.—The tremor often seen in hysterical cases closely simulates that caused by poisoning from lead, arsenic, mercury, etc. Lloyd is probably right in the belief that the tremor in its early stage, due to these poisons, is partly hysterical in its nature. The tremor of hysteria may be rapid, 8 to 12 per second; medium, $5\frac{1}{2}$ to $7\frac{1}{2}$; slow, 4 to 5 per second. The majority of cases of tremor of hysterical origin cease during repose if

the patient is not watched, and all, even those that are continuous during repose, are increased in extent by muscular effort, although the rhythm does not change. On account of the influence of exertion on hysterical tremor the latter has sometimes been mistaken for the intentional tremor of disseminated sclerosis.

Tremor in hysteria may develop very insidiously or suddenly, under the influence of fright or moral shock, and still more frequently after a convulsive attack. It may begin with a true attack of trembling. In order to distinguish hysterical trembling from the trembling in Graves's disease, it needs the evidence of other symptoms of either affection. Dutil (*Nouvelle Iconographie de la Salpêtrière*, Jan., Feb., '90).

Hysterical tremor is more common in men, and may resemble every kind of tremor associated with organic disease. If the tremor appear after a fit, it is of special importance in determining hysteria. When the tremor diminishes, it may be increased by pressure on the hysterogenic points. Charcot (*Le Progrès Méd.*, Sept. 6, '90).

Hysterical tremors may be detected by certain common traits. These are of three types: the hysterio-emotional tremors, arising from fright, emotion, etc.; the hysterio-toxic tremors; and a purely hysterical tremor, consecutive to hysterical attacks. Their evolution is often characteristic, coming on after a shock and attended with headache and intellectual troubles. The tremors may vary in character, and are not infrequently of an anomalous type. Oddo (*Marseille-méd.*, Oct. 15, '91).

The hysterical patient will often touch an object, as a nail driven into the wall, without much difficulty, but after the finger has remained a few seconds in contact with the object the arm becomes affected with an irregular, jerky tremor, differing from the tremor of multiple sclerosis, in which great effort is frequently required in bringing the finger

in contact with a small object, but the tremor ceases as soon as this has been accomplished. (Buzzard.)

DIAGNOSTIC POINTS AMONG THE MOTOR PHENOMENA OF HYSTERIA.—1. In aphonia, etherization and faradization of the throat will cause the patient to speak. Talking during sleep may occur, and singing is possible in many cases. The aphonia may have come on suddenly after emotional disturbance of traumatism. Paralysis of the vocal cords is always bilateral in hysteria; unilateral paralysis is due to organic disease. The aphonia disappears suddenly.

2. In hemiplegia the face is not paralyzed, although it is often anæsthetic on the side corresponding to that of the hemiplegia.

3. The leg is dragged or shuffled, the foot is not swung outward in bringing it forward, and the toes do not catch on the ground or floor as is the case in hemiplegia from organic brain disease.

4. The nutrition and electrical irritability of the muscles are well preserved.

5. The deep reflexes may be normal, and the plantar absent on both sides. If the knee-jerks are increased, the difference between the two sides is not great. Absence of the plantar on one side rarely occurs in hysteria.

6. On testing the strength of the flexor muscles there is abnormal contraction of the extensor muscles of the joint.

7. The flexor contracture of the hand is not lessened by forcibly flexing the wrist as occurs in organic disease.

8. Ptosis of hysteria is not due to paralysis of the levator, but to spasm of the orbicularis, and the spasm is increased on requesting the patient to look up. If double, the head is thrown backward on trying to look upward. If the head is held by some one both orbiculares contract (Gowers).

9. The ataxic gait is exaggerated beyond that of organic disease, and has the same psychological character as the muscular movements of the hysterical convulsion.

10. Astasia-abasia, inability to stand or walk, is always presumptive evidence of hysteria.

11. The tremor usually ceases during repose if the patient thinks that she is not watched, but it sometimes continues while the patient is sitting or lying. Voluntary motion increases the tremor. If the patient is requested to touch with the index finger of one hand a small object, little difficulty is experienced in doing this, but after the finger has been in contact with the object a short time, irregular jerky movements of the arm begin, differing from the tremor of disseminated sclerosis, in which great effort is frequently required in bringing the finger in contact with the object, but, this accomplished, the tremor ceases immediately (Buzzard).

12. It is probably safe to say that paralytic incontinence of urine and feces never occurs, and the presence of incontinence of either should always arouse suspicion of organic disease.

VISCERAL AND VASOMOTOR DISTURBANCES.—In many cases of hysteria these symptoms become quite pronounced, and some of them may persist for a long time, and become troublesome, or even dangerous to life. The pharynx may become so irritable that deglutition is difficult or almost impossible on account of spasm of the pharyngeal muscles resulting from the presence of food. Besides the *globus hystericus*, spasm of the larynx may take place and greatly embarrass respiration.

Functional dysphagia occurs more frequently in women than in men, but it is not uncommon in the latter, and may appear in children.

There may be pain, or a sense of con-

striction, or a feeling of a foreign body in the gullet often at about the cricoid cartilage, or even higher. The condition may be associated with *globus hystericus* or other evidence of hysteria, or the dysphagia may be the only symptom. Where there is evident spasm of the gullet, this comes on in advance of the act of swallowing. A. Coolidge (N. Y. Med. Jour., Aug. 28, '97).

Indigestion in some form is common in hysteria, but that form which interests us most in this connection is that in which the stomach and bowels become greatly distended with gas. Peristaltic movements of the bowels may be greatly lessened and in some cases apparently reversed. A section of the bowel may become greatly distended and form a phantom tumor of the abdomen.

Patient, male, aged 19 years, after a period of overwork, suffered so greatly from difficulty in breathing and palpitation of the heart, that he was obliged to remain eight weeks in bed. Later the curious symptom developed that with each inspiration the stomach filled with air, emptying again on expiration. The chemical and motor conditions of the organ remained normal and there was no sign of pyloric stenosis. Herz (Med. News, Jan. 1, '98).

Constipation may be so troublesome that neither brisk purgatives nor enemata have much effect. Vomiting often proves annoying and sometimes dangerous. It may occur almost immediately after the food is swallowed, apparently before it has reached the stomach (esophagismus). In some cases after the food has lain in the stomach for some time considerable gastric pain and distress are complained of and the food is vomited. In such cases, especially when the subject is a young girl, as is often the case, the symptoms of gastric ulcer are closely simulated and may cause some apprehension. Pure hysterical vomiting is unattended by nausea, and the patient

does not show signs of exhaustion from the act. It occurs fifteen minutes to an hour or more after eating, and the whole contents of the stomach are apparently ejected; but probably this is rarely so, as the patient may show comparatively little emaciation, although vomiting may persist for weeks. The emesis may be purely mental, or it may be partially voluntary, for purposes best known to the patient. It is well known that malingerers may become quite expert at vomiting at will. It is sometimes difficult or almost impossible to determine how much the vomiting is due to psychical influence and how much to pure voluntary effort. In some instances the vomiting may be so persistent as to endanger the life of the patient by starvation, but this is extremely rare. Hysterical anorexia may be so great that the patient is unable to take sufficient food to maintain life. In those cases in which persistent refusal to take food is kept up for weeks or months and yet the patient does not greatly emaciate, it becomes evident that deception is being attempted.

Irregular and rapid heart-action is common in hysteria and is often a source of apprehension and distress to the patient. The pulse-rate may be 100 or 140 per minute, or even more. The patient often becomes faint on the slightest exertion, such as made in turning in bed or sitting up. Dyspnoea and pseudo-anginal attacks may occur from a little extra physical effort, or from emotion, especially fright.

Frequent co-existence of hysteria and cardiac affections noted more frequent in men than in women, especially in those suffering from mitral stenosis, either alone or complicated with insufficiency. Hysterical præcordial pain, hysterical dyspnoea, and hysterical apoplexy should be carefully differentiated from similar symptoms due to cardiac

disease. (Giraudeau (*Le Semaine Méd.*, June 26, '95).

Rapid respiration, from 40 to 80 per minute, may be of hysterical origin. In these cases the pulse-rate may not be correspondingly accelerated. An annoying hysterical cough is not an infrequent symptom in young girls. I have never witnessed a persistent and continuous rise of temperature, 3° or 4° F. above normal, in hysteria, but cases presenting this symptom have been reported by competent observers. Intermittent rise of temperature is not uncommon. A difference in the axillary temperatures of several degrees has been observed. We should always be on our guard in cases of supposed hysterical fever and endeavor to detect any deception that may be attempted. Retention of urine is not an infrequent symptom in some female subjects.

Many vasomotor disturbances—such as local dilatation or constriction of the blood-vessels of the skin, flushing; unilateral sweating, especially of the head and neck; swelling of the hands or feet or of the joints—may occur in hysteria.

Case of ecchymotic spots and pemphigoid eruptions of hysterical origin. The ecchymoses appeared after a convulsive attack, and have persisted during two years. Raymond (*La Semaine Méd.*, Dec. 31, '90).

Certain vasomotor disturbances are found more or less frequently in hysterical cases. Generalized pallor of the body surface and flushings are part of the "splanchnic storms" which are more often found in hysterical and neurasthenic patients than in any other class of cases. The congestive patches constitute visible evidence of the reflex excitability of the local vasomotor mechanism. Erythromelalgia, dermatographia, and the exudative skin conditions are produced by the vasomotor neurosis plus toxic changes. The same etiological factors hold in regard to ischaemia.

In this group of cases, however, there is a vascular spasm only.

Among the co-operating causes which are sometimes in operation may be mentioned toxins of gastro-intestinal origin, articles of diet, traumatism, and toxins of insects. Without a vasomotor instability, inherited or acquired, these cannot act. It is interesting to note that some writers believe that auto-intoxication of gastro-intestinal origin plays a most important part in the causation of hysteria. If this is so, the etiology of exudative skin conditions and of hysteria are brought close together. G. L. Connor (*Jour. Mich. State Med. Soc.*, June, 1904).

PAROXYSMAL SYMPTOMS.—The convulsion is the most prominent symptom of hysteria, and, while it does not occur in the majority of cases of this disease, it is the one symptom first thought of by many, especially among the laity, when the term hysteria is mentioned. The hysterical convulsion of the classical type, first described by Charcot, and further elaborated and illustrated by his industrious pupil, Richer, is of very infrequent occurrence in this country. Here the paroxysms assume numerous atypical and abortive types. There are great similarities and dissimilarities between the hysterical and the epileptic convulsion. Prodromal symptoms are often absent, or if present are not recognizable in epilepsy. In hysteria they almost invariably occur, and are usually so pronounced as to be observed not only by the physician, but by the patient and attendant. They often begin several days before the convulsion takes place in pronounced cases of hysteria. In the lighter forms of this disease, especially in those cases in which the paroxysm is caused by temporary physical exhaustion or emotional shock, the prodromal period does not extend over more than a few hours at most, and frequently it is appa-

rently limited to a few minutes. After the exhaustion and excitement caused by attendance upon a ball, in which the patient has danced until the early morning hours, the emotional disturbance following a lover's quarrel, a sharp disagreement with an intimate friend, or the receipt of sad news, the subject becomes excessively nervous, impatient, irritable, and breaks out into fits of apparently causeless laughter or crying. The emotional disturbance and loss of self-control increase, and soon an hysterical convulsion, immediately preceded by an aura, supervenes.

In the majority of cases of hysteria the prodromal symptoms extend over a period of two or three days. The psychological phenomena are the more prominent. The mood of the patient changes; she is depressed, peevish, irritable, nervous, and unable to pursue her ordinary routine duties. She often becomes less sociable, keeps to herself, seems to be absorbed in her own thoughts, and may show evidences of being suspicious or the subject of hallucinations or delusions. Personal habits change; from being neat and tidy, she neglects her person and her dress. In some instances there is great increase of motor activity and there may be maniacal tendencies; in others, the patient is mute, broods, and becomes melancholic. The appetite is capricious, lessened, or lost; the tongue is coated, the digestion poor, there may be nausea and vomiting, and the bowels are often constipated. Sometimes deglutition is difficult on account of spasmodic action of the throat-muscles, and in some cases there may be spasm of the oesophagus or of the larynx. The stigmata of hysteria, especially relating to the sensory and motor phenomena, may develop or increase at this time.

The convulsion is immediately preceded by an aura, most commonly from the ovary; next from the throat, the *globus*; from the head, the *clavus*; or from any "hysterogenic zone." In the child the paroxysm may consist of a maniacal outbreak, with hallucinations or delusions; it may take the form of violent motional disturbance, inappropriately termed chorea major, attended with delirium and a tendency to break furniture; or it may be an epileptoid convulsion.

It is rare even in adults in this country to have the classical convulsion divided more or less distinctly into four stages. The first stage is known as epileptoid; the second, the period of grand movements; the third, period of passionate attitudes; the fourth, the period of delirium. In the hysterical convulsions that I have witnessed the first and second periods have been fairly well marked, but the third stages has been entirely absent, and only occasionally has the fourth period been present.

There are three periods in a complete hysterical attack:—

1. The preconvulsive period, in which the aura—mental, sensory, or ovarian—occurs.

2. The convulsive period, consisting of the tonic and the clonic spasms.

3. The post-convulsive period, of which the most striking feature is the delirium identical with the mental state which characterizes one or the other of the different varieties of hypnosis.

In the first period consciousness and memory are always preserved, and injury which might occur during the second period may be prevented by precautionary measures.

In the second period consciousness and memory are usually abolished, and the patient has no knowledge of the convulsions.

In the third period consciousness is usually preserved. He has knowledge of

his movements, and yet when the attack is terminated he is ignorant of what he has said and done during this third stage.

Any one of the three periods may exist alone. A. Pitres (*Revue Neurol.*, Sept. 15, '96).

[The following is rather typical of hysterical convulsions as I have observed them: An hysterical female at 22 years, after presenting many of the prodromal symptoms for two or three days, complained of a sudden choking sensation in the throat, which she said was rising and choking her. She fell, or, rather, sank, to the floor, without hurting herself. The whole body and limbs became rigid and she shook all over as one with a severe chill. The legs and feet were extended, the arms flexed at the elbows, and the fingers were firmly flexed over the thumbs. The pupils were slightly dilated, but equal in size and responded fairly well to light. The eyeballs were rolled in different directions under the closed lids, but on raising the upper lids the balls turned upward and inward. The face did not change in color perceptibly, although the breathing stopped for at least 30 or 40 seconds. At the end of about a minute clonic, convulsive movements began in the arms; the legs were flexed and extended at the knees and hips a number of times, and the head was turned from side to side in a rhythmical manner. During the period of clonic movements, which lasted about eight minutes, the pupils and color of the face remained normal and the tongue was not bitten. The patient did not soil her clothes nor froth at the mouth. After the clonic, convulsive movements ceased the patient lay as if exhausted. A pin-prick was scarcely recognized, and consciousness seemed greatly blunted, but on pressing over the left ovary the convulsive movements recommenced, and these were followed this time by opisthotonos, rolling of the body from side to side, and various exaggerated movements.

In watching this case the psychological character of the movements was well marked, and the movements seemed almost voluntary. They were different

from the reflex, forcible, shock-like movements of epilepsy. There was a rhythm in the movements which is never observed in the convulsive stage of true epilepsy. J. T. ESKRIDGE.]

There is, however, in many of the graver cases of epilepsy, especially in children and young adults, periods of maniacal excitement and hysteroid-like movements, which follow true epileptic convulsions. These may occur a few minutes, hours, or a day or so, after one or several epileptic fits. I have a case of epilepsy, in a girl 15 years old, under my care at present, in which maniacal outbreaks take place the first or second day after a series of convulsions. They have never followed a single convulsion in this patient.

There are many abortive and atypical types of an hysterical convulsion. A condition of ecstasy, somnambulism, catalepsy, trance, or lethargy may follow or even take the place of the convulsion. Charcot called attention to the fact that mental symptoms may take the place of the convulsive seizure. We may have no convulsion, but a condition of alternating consciousness, the abnormal state of consciousness apparently entirely replacing the convulsive seizure. I have one such case under my care at present.

It is important to bear in mind that firm pressure over "hysterogenic zones," especially over the sensitive ovarian region (?), will bring on a convulsion or may arrest it if the pressure is made during its progress. I have been able on two or three occasions to arrest an hysterical convulsion by forcibly pulling and flexing one of the great toes. Many of the stigmata of hysteria, such as anæsthesia, contracture, and paralysis develop or increase soon after hysterical convulsions.

Limited space will not permit me further to discuss the paroxysmal stage of

hysteria, although I have left many interesting points untouched.

Some points in the diagnosis of hysterical convulsions:—

1. The immediate cause of the convulsion is often some mental shock or physical exhaustion.

2. The patient sinks rather than falls to the floor, and rarely injures herself in sinking.

3. Pupils equal and rarely normal in size and respond to light. It must be borne in mind that strong and continued muscular movements will cause the pupils to dilate and will prevent their responding quickly to light.

Attention called to the absence of the pupil-reflex in attacks of hysteria. Observations were made in the clinic of Professor Krafft-Ebing, who confirmed the diagnosis and the fact of the absent reflex. The latter was also confirmed by the ophthalmologist Bernheim. The observations were made by having the lids held apart, the eye being illuminated by a hand-lamp and the cornea protected by salt solution. Thus the eyes could be observed for many minutes. The pupils were wide open and motionless for as much as twenty seconds. J. P. Karplus (*Wiener med. Woch.*, No. 52, '96).

4. The color of the face remains practically normal. There may be a slight venous congestion of the face if the breathing ceases several seconds beyond the interval observed in health. This is in marked contrast to the changes observed in the color of the face in severe cases of epileptic convulsions.

5. The tongue is not bitten, unless it is injured in the fall; but this is rare. There is rarely blood and froth oozing from the mouth, and the clothes are not soiled by the discharge of fæces or urine.

6. Consciousness in some cases seems to be fairly preserved, usually it is blunted, and probably is never as profoundly lost as in case of epilepsy.

7. The muscular movements are psychical in character, *i.e.*, they seem often to be purposive in their nature, and lack much of that pure reflex act observed in epilepsy. In hysteria rhythm or frequency of the movements is maintained, but the force varies; in epilepsy the frequency lessens, but the force of the muscular contraction is kept up until the convulsive movements cease.

8. The hysterical convulsion is usually much longer than the epileptic. They may last from ten or fifteen minutes to an hour or more.

9. Pressure over a sensitive ovary or other "hysterogenic zones" will sometimes arrest the convulsion.

10. Co-ordinated and exaggerated muscular movements, apart from the rhythmical clonic convulsive movements, especially marked if restraint is attempted, form a large part of the convulsion.

Differential Diagnosis.—At the end of each heading, *sensory symptoms, the special sense-organs, motor symptoms, and paroxysmal symptoms*, or *hysterical convulsions*, will be found a summary of the principal diagnostic points of each group of phenomena. It is unnecessary to repeat them here.

In the vast majority of instances the diagnosis of hysteria is comparatively easy if one is familiar with all the *earmarks* of the disease. Much precision and certainty is lost to that physician who regards hysteria as a protean disease, without certain constant and characteristic symptoms. While it is true that on superficial observation the symptoms of hysteria at times may appear to mimic those of nearly every organic lesion of the nervous system, viscera, and joints, yet, by a careful study of it, especially of the stigmata, their onset, course, and duration, it will be discovered that

hysteria is a definite and distinct disease with its own laws and clean-cut symptoms, and that the mimicry is but so in appearance. It must never be lost sight of that hysteria and organic disease may be associated. The two diseases may exist in the same person at the same time. Indeed, in one who is strongly predisposed to hysteria the development of organic disease will give rise to hysteria. In such cases it is important to bear in mind that the pronounced and more obtrusive symptoms of hysteria may, and frequently do, overshadow, if they do not entirely obscure, the indistinct symptoms of organic disease. A failure to recognize this fact is, I am quite confident, to blame for many mistakes, and not a few blunders that I have encountered in the practice of some excellent physicians.

The first duty of the physician on meeting with a case that seems to be hysterical in character is to determine, if possible, by repeated, thorough, and systematic examinations whether or not there is any organic lesion present. The presence of a multitude of symptoms, all pointing to hysteria, are not sufficient to rest a diagnosis upon, if there is one symptom that positively indicates an organic lesion.

CORTICAL LESIONS OF THE BRAIN.—

Paralysis and anæsthesia of the distal portion of a limb from a cortical lesion should never cause any difficulty in the diagnosis from hysteria, unless the patient is also the subject of the latter disease; yet I have seen cases in which this mistake has been made, in one instance, too, by a neurologist of no mean ability. In the first place, there is absence of the stigmata of hysteria. The paralysis and anæsthesia begin gradually, and the latter is rarely ever profound or extensive. If the lesion is irritative and attended by contracture, muscular wasting

will occur. The spasm is at first limited and Jacksonian in character. The deep reflexes of the affected limb are excessively increased, while those of the other limbs may remain normal or nearly so. Soon other symptoms of organic lesion, especially choked disks and evidences of intracranial pressure, develop. The reverse of all these symptoms obtains in hysteria. In the event that the patient were hysterical the presence of the positive symptoms of a focal lesion of the brain would make the diagnosis clear.

CEREBELLAR TUMOR.—Most of the cases of tumor of the brain that have been mistaken for hysteria have been located below the tentorium. I have one such case under my care at present. This patient was treated eighteen months for neurasthenia and hysteria. It is fair to state that she comes of hysterical stock, and has the most prominent of the stigmata, even to the paroxysmal symptoms. A careful history, which revealed the fact that certain symptoms pointing to organic disease began gradually eighteen months ago and has since slowly, but steadily, increased, together with unilateral facial paralysis and double choked disks, make the diagnosis easy.

HEMIANÆSTHESIA FROM BRAIN-LESION.—This is extremely rare unless associated with some motor disturbance. The deep reflexes, especially the knee-jerk, are increased to greater extent than is found in hysteria; hemianopsia will likely be present and the special senses on the hemianæsthetic side are less affected. In hysteria there is probably "crossed amblyopia." The hemianæsthesia that occurs in alcoholism and in some cases of metallic poisoning, especially from lead, is evidently hysterical in its nature.

HEMIPLEGIA.—The paralysis of one side of the face; the state of the reflexes,

—the deep excessive and the superficial slight, or abolished, on the paralyzed side; the absence of "crossed amblyopia"; or profound affection of the special senses would exclude hysteria as the cause.

HEMIANOPSIA.—If due to organic brain-lesion in the occipital lobe this may be the only symptom, except, perhaps, pain in the head. It is not changeable and persists for a long time, if not for life. In hysteria it is transient, changeable, the other fields are narrowed, the conjunctivæ of both eyes are anæsthetic, the color-fields are probably reversed, and other stigmata of hysteria are present.

PARAPLEGIA.—If due to myelitis affecting the lumbar region, paralysis of the anal and vesical sphincters, the loss of the reflexes, muscular wasting, bed-sores, and the reactions of degeneration would stamp the nature of the trouble. If the cervical or dorsal cord or the lateral columns were the seat of the lesion the exaggerated reflexes with true ankle-clonus and other evidences of organic disease would serve to determine the character of the trouble. In poliomyelitis the muscular wasting, loss of reflexes, and the reactions of degeneration would exclude hysteria as the cause of the paralysis. Syringomyelia has many symptoms in common with hysteria, but the muscular wasting, often the weakness of the sphincters, the changes in the reflexes, and the absence of the stigmata of hysteria would be sufficient on which to base a diagnosis. Multiple neuritis presents organic changes, as shown by reflexes, wasting, and the reaction of degeneration.

DISSEMINATED SCLEROSIS.—Buzzard says: "Multiple sclerosis, like hysteria, is common in women at puberty; a history of some moral shock often precedes both; there are few cases of multiple

sclerosis in which there are not hysterical symptoms added; and many symptoms of the former have long been looked upon as hysterical." The same writer states that the plantar reflexes are usually well marked in multiple sclerosis, and feeble or absent in hysteria. Paralysis is usually sudden in its onset, and more complete and flaccid in the latter than in the former. When blindness occurs in one eye, it is generally complete at first and comes on suddenly in hysteria, whereas in multiple sclerosis absolute blindness in one eye is rare. In the latter the acuity of vision lessens gradually with contraction of the visual fields, until the eye is almost useless; then vision improves in this eye and fails in its fellow. Atrophy of the optic nerve and nystagmus occur in multiple sclerosis, but are probably never of hysterical origin. The tremor of multiple sclerosis may be simulated by an irregular tremor occurring on voluntary movement in hysteria, but in the latter the excursions are usually less; there are a tardiness of the initial muscular effort and a contraction of the antagonistic muscles. Gowers lays considerable stress upon the diagnostic importance of the presence of the last symptom. The hysterical patient affected with tremor will often touch a small object with the index finger without much difficulty, but after the finger has remained a few seconds in contact with the object the arm becomes affected with an irregular or jerky tremor, differing from the tremor of disseminated sclerosis, in which great effort is frequently required in bringing the finger in contact with an object, but as soon as this has been accomplished the tremor ceases.

Cases of CEREBRAL SYPHILIS frequently present hysterical symptoms. If the symptoms are typical of the latter,

and there is no positive evidence of organic intracranial lesion, the true nature of the malady can only be suspected from the history of infection or from the evidences of syphilis in other portions of the body.

Feigning.—In most cases of hysteria that I have met there has been an exaggeration of some symptoms, and in not a few some have been intentionally or unintentionally feigned. It is a comparatively easy matter to distinguish between a case of simple feigning and hysteria. Given a case of traumatic hysteria with the stigmata of the disease well marked, it is not always an easy matter to say just to what extent intentional feigning enters into the symptoms.

INSANITY.—It is a mistake to class symptoms of monomania, such as claustrophobia, mysophobia, etc., among those of hysteria.

NEURASTHENIA. — Theoretically, the difference between hysteria and neurasthenia is well marked. The former is a disease with its stigmata and paroxysmal symptoms, all or any of which may come on or end suddenly; the latter is an exhausted state of the nervous system, having a gradual beginning and ending, and unattended by stigmata or paroxysmal symptoms. Practically, however, hysteria is a psychoneurosis, and neurasthenia, while it begins as a neurosis, frequently becomes a neuropsychosis. Nerve-exhaustion in a person who is predisposed to hysteria may cause the development of the typical symptoms of the latter disease. In cases in which hysteria and neurasthenia are associated a careful study of the manner in which individual symptoms have developed will usually enable one to determine which is the primary malady.

EPILEPTIC CONVULSION.—There will, as a rule, be little difficulty in distin-

guishing between an epileptic and an hysterical convulsion, especially if the physician is fortunate enough to witness the seizure. If this is impossible the presence of an educated nurse, especially trained for this purpose, is absolutely necessary for information on which to base a diagnosis. Points in the diagnosis will be found in this article in connection with the description of the hysterical convulsion. Almost the reverse of these conditions obtain in an epileptic fit.

Feigning.—It is not infrequently necessary to differentiate between an hysterical and a feigned convulsion. This is not difficult unless the malingerer is familiar with the stigmata and paroxysmal symptoms of hysteria. The latter, like dementia, is a most difficult condition for the ignorant to feign. If the malingerer should be a physician or a clever trained nurse the differential diagnosis might be most difficult, and sometimes, perhaps, impossible.

Etiology.—Can a person who is not the subject of a vitiated inheritance develop hysteria on being subjected, for a prolonged period, to some of the well-known causes of hysteria? Or, to put it differently, is the only predisposing cause to hysteria heredity? Such a conclusion has been reached by some alienists in regard to the predisposition to insanity. So few are born with a nervous system free from hereditary taint of some kind that it is very difficult to answer the query here propounded. Personally, I can see no reason why such exciting causes of hysteria as trauma, toxæmia, shock, and certain chronic diseases may not so exhaust and disarrange the nervous apparatus that it will become almost, if not quite, as weak and unstable as that which may be inherited from an unhealthy ancestry. Probably

the predisposition to hysteria when acquired is less typical than when inherited.

HEREDITY.—Herman B. Sheffield is almost alone in attributing slight influence to heredity in the causation of hysteria. It does seem, especially to those who have given the subject of heredity much careful study and who have observed the offspring of unhealthy ancestry, that it is impossible to belittle the direct and indirect influences of heredity as a predisposing cause of hysteria. It is probable that the children of hysterical parents would not themselves become hysterical could they be excluded from all the trying ordeals of life. Such children, however, have weakened, irritable, and unstable nervous organizations, and even the little home annoyances, from which no one is free, are often sufficient to give rise to an attack of hysteria. Briquet found in a study of 351 hysterical subjects that a neurotic element existed in about 25 per cent. of the relatives, and in healthy, non-hysterical women it was traced in only $2\frac{1}{8}$ per cent. As a rule, the earlier in life that hysteria develops, the greater the neurotic element in the relatives. Any influence in the ancestry that vitiates the nervous organization may lead to a degenerative taint in the children. Insanity, epilepsy, alcoholism, syphilis, injuries to the head, etc., in the parents, may indirectly predispose the children to hysteria. Fully-developed hysteria, of course, is never inherited, but a predisposition to it, a soil favorable for its development, well marked or slight, is probably almost universal in children of hysterical parents, and commonly exists in those who are born with weakened nervous organizations. While most women and many men have nervous organizations favorable for the development of

hysteria if they are subjected to exciting causes sufficiently strong, yet they retain ample resisting power to cope with all the ordinary trials of life to enable them to prevent manifesting the disease. I have met many strong men who admitted that they felt hysterical, although I could detect no symptoms of the disease.

Attention called to the comparative frequency with which hysterical symptoms are superimposed upon cases of organic disease of the nervous system. In these cases there is often a neuropathic ancestry, which may be considered the predisposing, as the disease itself is the determining, cause of the neurosis. C. H. Hughes (*Jour. Amer. Med. Assoc.*, Sept. 17, '92).

Direct heredity is frequent in hysteria, and, according to Briquet, half the hysterical mothers give birth to hysterical children. Liability to convulsions is one of the nervous manifestations most frequently transmitted to offspring (Féré). Silvio Ciarrocca (*Gior. Inter. delle Scienze Med.; Can. Pract.*, July, '98).

AGE.—Hysteria is most common between the tenth and twentieth years of life. In nearly one-half the cases the disease first manifests itself during the second decade of life. The disease rarely begins after the fortieth year and is infrequent before the seventh. Of the 92 cases reported in America occurring before the fifteenth year, one child was $1\frac{1}{2}$ years old; one 2 years; three 3 years; and four 4 years.

Two epidemics of hysteria observed in Moscow. One occurred in a school for girls (aged 10 to 13), as many as 18 out of 21 being consecutively attacked. The other case was observed in a lace-factory where a number of young girls, aged from 19 to 26, were engaged. Shataloff (*Wratsch*, No. 9, '91).

Hysterical angina occurs more frequently in women under forty, tends to periodicity, to become nocturnal, and the attacks are induced by violent emotion.

H. T. Patrick (*N. Y. Med. Jour.*, Feb. 22, '96).

Hysteria exists in children at all ages. Eight of the eighteen cases observed were below four years of age, and as many of them were boys as girls. It is as frequent in children as in adults. M. Terrien (*Archives de Neurol.*, p. 299, Oct., '97).

During childhood the discrepancy between the sexes in regard to the relative frequency of the disease is less marked than later in life. Of the 92 cases occurring in children, analyzed by Sheffield, 61 were found in the female and 31 in the male, a proportion of two to one in favor of the female. In adults the disease is ten or fifteen times more frequent in the female than in the male.

Twenty-two cases of male hysteria seen in the course of four years in a ward of thirty-eight beds. Most of these patients were robust, vigorous men, quite able to follow their occupations. Bitot (*Jour. de Méd. et de Chir. Prat.*, Jan. 10, '91).

RACE.—Hysteria is found among all races; even the savage does not escape altogether, but to a much greater extent than the civilized. The negro in America is frequently the subject of the disease. The Jews, especially the Russian Jews, in proportion to their limited population, give the largest number of cases. Among the Latin races of our population is found more hysteria relatively than is met with in the native-born. The disease is apparently more frequent in the mild and warmer climates than in the cold.

ALTITUDE.—Persons who are exceedingly nervous, impressionable, and predisposed to hysteria are probably more likely to develop the disease on coming to a high altitude than at sea-level. Like chorea, hysteria is probably most frequent during spring and fall. The conditions inseparable from civilization, especially worry, overwork, and excitement

favor the development of hysteria. We meet with cases of habit- or imitation-hysteria just as we see cases of "habit-chorea." Defective education and vicious home-influences, especially as seen with hysterical mothers and oversympathetic friends, are potent causes of hysteria among weakly children and emotional young women.

TRAUMA.—The influence of traumatism in the causation of hysteria has received a great deal of attention from the neurologists during the past fifteen years, and, I think, deservedly so. The cases have formed a group by themselves, and have received the names: "traumatic neurosis," "traumatic psychoneurosis," and "traumatic neurasthenia." They are apparently cases of pure hysteria, and the name "traumatic hysteria," proposed by James Hendrie Lloyd, is probably the best we have. Cases of hysteria from traumatism are frequently the subjects of litigation. It may occur in its most persistent form from apparently slight injuries, and is often found in persons who have no claims for damages. Hysteria from traumatism often persists for years, and sometimes for life. The paroxysmal symptoms are frequently well marked, and those that may persist for an indefinite time are spinal hyperæsthesia, hemianæsthesia, local paralysis, tremor, contraction of the visual fields, headache, nervousness, and exhaustion. These cases may be distinguished from feigned disease by the presence of the stigmata of hysteria. Traumatic hysteria is by no means limited to the female sex.

Various neuroses may originate from accidents of all kinds, and frequently in consequence of very slight traumatisms in which the psychological element is the main factor. In most cases the phenomena can readily be placed under the head of hysteria. Very frequently hysteria is

mixed with neurasthenic symptoms, or the latter alone present. Dubois (Corres. f. Schweizer Aerzte, Sept. 15, '91).

Case of a thirty-three year old man who a year previously had been in a railroad collision in which he had suffered from a slight concussion of the brain. He would have attacks of clouded consciousness with a peculiar form of delirium in which he lived over the incidents of the collision. Westphal (Deutsche med. Wochen., Jan. 1, 1904).

TOXÆMIA.—Alcohol, morphine, cocaine, lead, arsenic, sulphide of carbon, and autoinfection may give rise to hysteria. Most of these poisons may cause organic changes in nervous structure, and the cases may present symptoms of hysteria and of organic disease at the same time. They may, however, result in hysteria when no recognizable organic changes have taken place.

The motor and sensory paralysis of hysteria may be dependent upon structural alterations in the nerve-centres. Th. Leber (Deutsche med. Woch., Aug. 18, '92).

Of 60 cases of hysteria in men, alcohol was the exciting cause in 18. Alcoholic hysteria is similar in all points to hysteria from other causes.

Hysterical attacks are especially likely to be brought on by a fresh drinking-bout in the subject of chronic alcoholism, in whom also traumatic hysteria is especially liable to occur. Similar manifestations of hysteria are also met with after chloroform narcosis and in subjects of the morphine habit. Lüthmann (Archives de Neurol., Nov., '95).

Depressing or irritating mental and moral influences are potent factors in the causation of hysteria. To religious excitement may be attributed a number of cases of the disease. Whatever lessens vigor, exhausts, or depresses, may give rise to hysteria in the predisposed. Among causes thus acting may be placed diabetes, syphilis, typhoid fever, influenza, chlorosis and anæmia, etc. Sexual excesses, masturbation, and ungratified

sexual desire are depressing in character and tend, in persons hysterically predisposed, to act as exciting causes of the disease.

Number of cases in which the advent of malarial fever seemed to exert a curative effect upon the hysteria from which the patient suffered. Attention called to a similar phenomenon in epileptic persons. M. E. Marandon de Montyel (*Presse Méd.*, Oct. 20, 1900).

DISEASE OF THE GENERATIVE ORGANS.

—There is no doubt that many of the lighter and irritating affections of these organs, both in the male and female, increase the nervous condition of the sufferers, and, if they are not the direct exciting causes of attacks of hysteria, they increase the liability to them and exaggerate the symptoms when the disease is present. It seems true, also, that the depressing effects of prolonged attacks of hysteria increase the tendency to the development of disease of the generative organs. Operative interference on the generative organs, especially in the hysterical female, should only be undertaken when the local condition justifies it. Ovaries should not be removed in the hope that the psychological effects of the operation will cure the hysteria.

In both hysteria and hystero-epilepsy it is necessary to distinguish carefully those cases in which the symptoms are clearly referable to the reproductive organs. These, and these alone, should be operated upon, nor should oophorectomy be performed on these cases until every other means of relief has been exhausted.

Operation usually discloses ovaries in a more or less sclerotic condition, and often with cystic degeneration. Adhesions are found in some cases, but not in all. The uterus is sometimes smaller than normal, and sometimes, but not always, its position is not normal. Dudley P. Allen (*Western Reserve Med. Jour.*, Dec., '95).

Hyperæmia of the vulva and vagina found in seventeen cases of hysteria; it

was commonly associated with hypersecretion of the glandulæ Bartholini, and in some cases perhaps caused by masturbation. Vedeler (*Norsk Mag. f. Lægevidensk.*, p. 317, '99).

Diseases of the female generative organs are not more often responsible for hysteria than other diseases in general. As a rule, reflex disturbances arising from the genital tract can be traced by direct continuity. The greater number of neuroses observed in gynaecological practice are to be assigned rather to the degenerative hysterical group than to typical hysteria. The history of the patient and the minor lesion with the major complaint, together with a vicious heredity, will often support the diagnosis of hysteria. Gynaecological operations of a simple nature and the anaesthesia itself can have an important bearing on the nervous system. Suggestive treatment is useful, while local measures often cause a decided change for the worse in conditions resting on a nervous basis. Von Voss (*Monats. f. Geburtshilfe u. Gynak.*, Vol. viii, No. 4, 1904).

ORGANIC DISEASE IN GENERAL AND OF THE NERVOUS SYSTEM ESPECIALLY.

—As is well known, there may be an association of organic and functional disease at the same time, or a person who is predisposed to hysteria may develop organic disease, and this, in turn, may cause the manifestation of hysterical symptoms. We have then, as S. Weir Mitchell has so graphically expressed it, "the symptoms of real disease painted on an hysterical background." The fact that the seat of the organic lesion often determines the location and the character of the hysterical symptoms not infrequently misleads the physician, and may cause him to err in diagnosis if he is not on his guard. We often meet with tuberculosis and hysteria in the same subject. A catarrhal condition of the larynx may cause hysterical aphonia, dyspnoea, or even spasm of the larynx. An inflamed joint in a person predis-

posed to hysteria may lead to the development of hysterical symptoms, such as contracture and paralysis of the limb. It is not uncommon for a case of tumor of the brain to present many of the most pronounced symptoms of hysteria. I have at present a patient under my care who has been treated for a period of eighteen months for hysteria and alleged uterine and gastro-intestinal disorders. She has been subjected to several operations by certain official surgeons. Besides her hysterical symptoms, she has double-choked disk, blindness, intense headache, vomiting, cerebellar titubation, and paralysis of one side of the face. A careful examination, and the recognition of the symptoms of organic disease would have prevented the error in diagnosis and saved the patient unnecessary annoyance and pain, and her friends needless expense.

I have seen a few cases of tubercular meningitis in the adult in which the early symptoms were of an hysterical character.

SUGGESTION, while probably not a direct exciting cause of hysteria, yet is capable, when the disease is present, of exaggerating the symptoms, and possibly may, in persons who are very nervous and hysterically inclined, be the influence sufficient for its development. Repeated medical examinations, while the physician makes from time to time diligent inquiries for certain associated symptoms, soon lead hysterical subjects to assume the lacking phenomena in their own cases; so that what was at first a slight hysterical disturbance becomes in time fully-developed hysteria. I have observed the effect of suggestion on hospital patients who were not at the time the subjects of examination, but intently watching the investigation of other patients in the same ward.

Pathology.—So far as we know, hysteria has no anatomical basis. In the absence of any demonstrable change in the central nervous system its pathology must remain theoretical and speculative. As the clinical phenomena of this disease are observed there seems to be a faulty interpretation or misinterpretation of afferent impressions, a morbidly-emotional state, with disturbed will and reason; hence all the efferent impulses, both conscious and subconscious, are perverted or allowed to run at a tangent. The morbid process is probably a disturbed condition of the cerebral cortex, affecting the neurons, their processes, and the protoplasmic material, giving rise to perverted function of the highest nerve-centres and leading secondarily to derangement of the normal or harmonious action of the lower centres and of the sympathetic nervous system.

Hysteria, in its local manifestations, is limited to psychical processes. Although the disturbed centre is in the cerebral cortex, still all the manifestations of hysteria appear in all possible territories of the nervous system. The nature of the disturbance of the cerebral cortex may be one of three types: 1. There may be a deadening of the sensory excitability of the cerebral cortex resulting in symptoms of hypæsthesia, anæsthesia, hypalgesia, and analgesia; or a deadening of the cortical motor discharge, resulting in paresis and paralysis. 2. There may be an intensification of the perception of the entering impulse manifested by hyperalgesia and hyperæsthesia; or an intensification of the energy of the motor discharge, resulting in spasms and convulsions, often reflex in character. 3. There may be confusional interpretation of entering impulses, manifested by symptoms of paræsthesia; or confusion in the motor discharge of cortical cells, resulting in hysterical ataxia, and in such contractures as are due to the imperfect distribution of motor impulses to groups of opposing muscles. Predisposing causes

include heredity, age, sex, protracted and exhausting diseases, sexual disorders, and faulty home-training. Exciting causes are psychical and physical trauma, suggestion, and various toxæmias. C. L. Mix (N. Y. Med. Jour., Aug. 4, 1900).

Prognosis.—The disease is rarely dangerous to the life of the patient, yet it must be borne in mind that a person may become so exhausted that death takes place in spite of the efforts made to improve nutrition. Gowers mentions one case of death from spasm of the larynx. The prognosis of severe hysteria in childhood is not as good as some writers seem inclined to believe. Children so afflicted not infrequently become chronic hysterical subjects as they grow to years of maturity. The mental development is often deficient in such children. The lighter forms of hysteria, both in children and adults, usually recover comparatively rapidly if judicious treatment is instituted. The inherited nervous or hysterical temperaments, and sometimes the acquired predisposition, also continue through life. The natural tendency of all cases of hysteria is to chronicity. In nearly all the milder cases, and in the vast majority of the severer ones, the symptoms, including the stigmata and the paroxysms, disappear entirely under favorable circumstances, but relapses are common if the patients are subsequently subjected to trying ordeals. Cases which show evidences of beginning mental degeneration are practically hopeless. Traumatic hysteria may last for years, or even a lifetime. Spontaneous cure rarely occurs in the male, although hysteria in the male subject is usually curable. It seems to be the experiences of most physicians that hysteria in the female, associated with chronic pelvic troubles, is very obstinate, and often rebellious to treatment. Paralysis, contracture, or anæ-

thesia may persist for a long time and finally disappear rapidly or even suddenly.

A fatal termination may sometimes result from the different effects of hysteria, and death may be due to spasm of the glottis so severe as to require tracheotomy. Sudden death may occur after hysterical vomiting,—in one such case no lesion of any kind being found on post-mortem examination. Fournier and Sollier (Jour. de Méd., Aug. 25, '96).

Treatment.—**PREVENTION** is of great importance. If more attention were paid to it during childhood and early youth there would be fewer cases of hysteria, both in children and adults. Vitiating states of the nervous system in parents and their ancestors may give to the offspring weak, irritable, and unstable nervous organization. The associations and environments of such children, frequently consisting of hysterical manifestations in the parents or other relatives, undue parental anxiety and sympathy, lack of self-control, vicious habits and methods of education, may suggest trains of thoughts and actions to the children that will sooner or later lead to the development of hysteria in them. When practicable, oversympathetic and over-anxious parents should delegate the early education and care of their children to suitable nurses or attendants. Separation of the children from such parents and other relatives is followed by good results if tutors and companions are selected with judgment, so that the training is in the right direction. While the mental training, which is the more important, should be carefully looked after and continued for years, the physical should not be neglected. Open-air life and exercise should be insisted upon as much as possible; cool or cold baths ought to be given night and morning, followed by brisk rubbing of the skin by

means of a coarse towel; the diet should be nutritious and easy of digestion, and most of the sweetmeats excluded; regular and systematic habits as to eating, sleeping, exercise, and study should be rigorously maintained; and any disorder of the health should be corrected as soon as possible.

DEVELOPED HYSTERIA.—As isolation is of the utmost importance in the treatment of hysteria, considerable judgment and skill are necessary in selecting those who are to form the companions of hysterical subjects. The nurse should be faithful, educated, and well trained, and have good sense, tact, patience, gentleness, firmness, and diligence in her work. The patient is often compelled to be alone with her nurse for months, and if the latter is tactless and irritating the best-directed efforts of the most skillful physician will be defeated. The physician should be firm, but gentle, and the possessor of considerable personal magnetism. Unless the physician can inspire the confidence and respect of his patient he should not undertake the treatment of a severe case of hysteria.

The rest-cure of Weir Mitchell has many advantages in the treatment of hysteria. It gives an opportunity to separate the patient from parents and sympathetic relatives and friends; it enables the physician to carry out to the letter, without interference, special plans of treatment; and it affords an opportunity to inspire the patient with hope by the proper suggestions, without the latter being constantly counteracted by "Job's comforters." The rest-cure is not necessary for all cases of hysteria, but there are few that will not improve much more rapidly by isolation from relatives and friends than they will at home.

Many marked cases react well under the rest-cure when organic disease is absent. The treatment is as follows:

The patient is placed in a private house (according to means), and best if away from home, the room being sunshiny and freely capable of ventilation. The nurse should be, preferably, young, of agreeable manner, and a stranger to the patient. She should never converse with the patient about symptoms or treatment. She should be able to read aloud. Isolation is most important, and the more distinctly hysterical the disease is, the more strict the isolation must be. "No letters are sent or received, no visitors seen, and but three or four persons enter the room: the nurse, the physician, the *masseuse*, and the servant." In ordinary cases six to eight weeks of isolation are long enough, after which a single visitor may be allowed. Letters may then be received or written in the way of reward for good conduct. This long isolation is necessary to break up radically the habits of long invalidism. Rest, at first ill borne and irksome, is well borne after a week. At first feeding should be done by the nurse, and the patient overfed. All voluntary movements should be forbidden, except sitting up for the bowels, etc. The circulation and thinking are thus kept at a low level, and one result soon observed is the improvement of the ability to sleep.

Diet: Milk in small quantities is given every three hours, skimmed, if ordinary milk is not tolerated. On the fifth day or treatment a chop or steak at midday is given. From the sixth day onward bread and butter and eggs are allowed. If milk is badly borne, broth and jellies will give satisfaction.

Massage: A separate *masseuse* is desirable. Massage should begin on the third day with light massage lasting twenty minutes, and increasing daily to deep massage lasting one hour or more. If the patient is obese, long and deep massage is good. A second rubbing of the abdomen and spine by the nurse before sleep is helpful. At the end of the first week the patient will begin to put on weight, but if this goes up too fast, massage is not thorough enough and should be increased. Oil is not necessary to aid massage.

Electricity: The slowly interrupted faradic current should be applied to the "motor points" all over the body so as to contract every muscle two or three times. This should be continued for three-fourths of an hour. Constipation is treated with aloes and strychnine pills, and for specially refractory cases hot injections of castor-oil per rectum may be given. Insomnia is diminished by massage before bedtime. Hypnotics should be avoided, and the wet pack or abdominal compresses first tried.

After the first week the patient is allowed to sit up fifteen minutes, the next day twenty minutes, etc. In a fortnight she is allowed to walk in the room after passive movements of the legs have been carried out. Swedish movements complete the exercises and the cure. The disease is not restricted to women of fashion and indolence, as it is often met with in school-teachers, washer-women, and other persons submitted to menial occupations. J. K. Mitchell (*Jour. Amer. Med. Assoc.*, Mar. 9, 1901).

Psychic treatment is fundamental in hysteria, although electrotherapy, supralimentation, and hydrotherapy are valuable. The object is first to remove all causes of painful emotion, and second, to render the subject less susceptible to such causes. The first is easier to write than to carry out; but sympathetic friends should be kept away and every thought and suggestion that produce emotion should be avoided by the attendants and the patient; fatigue must not be allowed by exercise or otherwise, and digestion must be scrupulously regulated. Finally, by suggestion, the character must be reformed on solid grounds, by talks with the patient in which her fears are shown to be groundless. The writer has the patient close her eyes, but explains at length that he is not attempting to hypnotize her, and then suggests that her health is about to be re-established and all unpleasant manifestations are to disappear, each symptom being dwelt upon, and its particular disappearance guaranteed. It is a sort of mental vaccination

that must be accomplished, and, above all, the treatment must be continued till all chance of relapse is banished. The patient must be thoroughly persuaded of her recovery and have ceased to dwell upon her former troubles. P. E. Lévy (*Presse Medicale*, Nov. 7, 1903).

Forced feeding, massage, and faradization are important aids in the treatment. Milk is one of the best articles of diet. It should be deprived of most of its cream at first. This may constitute the only article of diet in the rest-cure cases for two or more weeks. Food should be given the patient every two hours while she is awake. Massage and electricity may be employed daily or on alternate days.

Strong galvanic currents (20 to 60 milliamperes; electrodes, 6 by 12 centimetres) to the back and ovarian region used with almost uniformly good results in hysteria. Hirschfelder (*Med. Standard*, Aug., '91).

In hysteria the rain-shower and the jet are usually efficacious. Dana (*Dietetic Gaz.*, Dec., '91).

Neurasthenic patients who are also hysterical often derive great benefit by static electricity or by franklinization.

Most, but not all, hysterical patients whose condition is improved by static electricity show an intolerance, varying in degree, toward the high-frequency currents, and especially toward autoconduction in the electric cage. Faradization, which is, as a rule, indicated as alone serving to produce an effect upon certain local hysterical troubles, especially those of sensibility in one organ or a limited region, is often powerless, while static electricity, which acts in a general manner, may give more rapid and more effectual results. Apostoli and Planet (*Annales d'Electro.*, May 15, '98).

The moral treatment is of great importance and requires tact and skill on the part of the physician and nurse. In some cases hypnotism may be resorted to so that suggestions may be more effective; but, as a rule, this should be avoided,

and is, in the vast majority of cases, unnecessary. Repeated assurances on the part of the physicians may inspire the hopes of the patient; especially is this true if the nurse has the tact and good judgment to increase the patient's confidence in her physician.

As a rule, it is best to get along with as little medicine as possible. It is a mistake absolutely to prescribe the bromides in hysteria, as some have done. Sodium bromide in 10-grain doses after each meal, diluted with half-glass of water, is often effective in relieving restlessness and sleeplessness. It should be employed only for such special purposes. Its indiscriminate use in these cases cannot be too strongly condemned. Such tonics as reduced or lactated iron, arsenic, valerianate of zinc, extract of sumbul, etc., may be given as occasion requires. I have never employed oil of turpentine, recommended by Gowers to be pushed to the point of strangury.

The special symptoms often require relief. Aphonia is sometimes relievable by the faradic current applied to the throat externally. Weir Mitchell has tried it with success in some cases, teaching the patient to endeavor to speak only after fully inflating the lungs. Paralysis sometimes disappears suddenly. Usually after applying massage or electricity the patient may be induced to move a group of muscles, and if this is commented on favorably the voluntary movements may be increased after each treatment. Contracture is best treated by gentle measures, such as rubbing the parts and gradually extending the limbs a little from time to time. Sometimes it is necessary to etherize the patient and forcibly extend the limbs, or even perform tenotomy. Anorexia and vomiting are best overcome by absolute rest in bed, judicious feeding, and firmness in the man-

agement of the patient. If the food continues to be ejected the nasal tube may be employed with good effect. The sensory disturbances may be treated with the faradic brush, small and repeated blisters, and suggestion. Retention of urine should not be relieved by the catheter until all other means have been exhausted. One of the most effective methods that I have employed is the application of ice to the abdomen or a cold douche to the spine. Suggestion sometimes is sufficient to enable the patient to empty her bladder.

An hysterical convulsion may often be arrested by the sudden and unexpected application of ice to the spine or abdomen, or by placing the patient in a tub and pouring a bucket of cold water over the head and body. A prompt emetic will usually arrest a fit. The best for this purpose is $\frac{1}{10}$ grain of apomorphine given hypodermically. Inhalation of nitrite of amyl will often cause the convulsion to cease. H. A. Hare has recommended holding the patient's nostrils closed for 30 or 40 seconds. Pressure over the sensitive ovary does not always succeed. I have been able on two occasions to cause a sudden cessation of the convulsion by grasping the patient's great toes with each of my hands and firmly extending and flexing them.

Apomorphine recommended for hysterical attacks. An injection of $\frac{1}{10}$ grain (0.006 gramme) cuts short hysterical attacks, hystero-epilepsy, and epilepsy. The vomiting and subsequent depression both have a sedative effect on the nervous system. One great advantage of the treatment is the saving in time. The doctor can leave the house within fifteen minutes. Faucher (Bull. Méd. de Québec, Jan., 1902).

J. T. ESKRIDGE (Denver) and
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I

ICHTHYOL.—Ichthylol (ammonium ichthylol-sulphonate) is a distillation product prepared from a bituminous mineral, found in the Tyrol, which is rich in fossilized remains of fish and sea-animals, whence the name "ichthylol" (*ἰχθύς*, fish). By dry distillation of this bituminous mineral a crude volatile oil is obtained which, at a temperature of 212° F., is treated with an excess of concentrated sulphuric acid, forming ichthylol-sulphonic acid. This latter substance unites with the alkaline bases (ammonia, soda, lithia, etc.) and forms ichthylol-salts, of which the principal ones are ammonium ichthylol-sulphonate (or ichthylol-ammonium) and sodium ichthylol-sulphonate (or ichthylol-sodium), the former being always understood when the term ichthylol is used alone. These substances are rich in sulphur (about 15 per cent.), which is combined partly with oxygen, partly with carbon, in a condition similar to that in mercaptans and organic sulphides (Baumann). Ichthylol has a reddish-brown color and a bituminous taste and odor. The sodium salt is semisolid (the consistency of a solid extract), and the ammonium-salt is a thick, brown liquid of the consistency of syrup. Ichthylol is readily soluble in water and in a mixture of equal parts of alcohol and ether; it mixes well with lanolin, vaselin, glycerin, fats, and oils, and with collodion and traumaticin.

Preparation and Dose.—Ammonium ichthylol-sulphonate, 3 to 20 minims.

Lithium ichthylol-sulphonate, 3 to 10 grains.

Sodium ichthylol-sulphonate, 3 to 10 grains.

Zinc ichthylol-sulphonate.

Hydrargyrum ichthylol-sulphonate.

Physiological Action.—Ichthylol has

antiphlogistic, anodyne, alterative, antipruritic, antiseptic, and astringent properties. Its peculiar virtues are largely ascribed to the large amount of sulphur it contains.

When administered internally, although having a peculiar odor, it excites no nausea. In medicinal doses it is believed that it retards the disintegration of albuminoid substances and favors their formation and assimilation (Zuelzer, Charles). In larger doses it increases peristalsis and has a laxative action on the bowels. Helmers has found that a third of the sulphur contained in the drug is eliminated by the urine, while the remaining elements pass out in the feces. He also finds that the sulphur of the ichthylol takes at least seven days to be completely removed from the organism; hence he concludes that ichthylol is not simply passed through with the food-excretions, but is first absorbed into the system and then again secreted.

When applied locally, it acts as a reducing agent (abstracts oxygen from the tissues) and exerts a peculiar contractile effect upon the vascular tissues; hence the application of ichthylol is followed by a diminution of heat, a reduction of swelling, a paling of the tissues, and a relief of pain (Unna). Moreover, the drug undoubtedly inhibits bacterial development, as proved by the experiments of Fessler and Klein.

Ichthylol is absorbed by the normal skin of the dog; an evidence of the absorption is afforded by the increase of sulphur in the urine. The skin appears to be penetrable to such substances as are readily soluble in water and in fat, whereby these substances are enabled not only to act upon the deeper cutaneous layers, but are also able to exert effects in distant parts of the body. Cornelius Beck and Bela von Fenyvessy (Archiv

internat. de Pharm. et de Therap., vi, Nos. 1 and 2, '99).

Injected subcutaneously, ichthyol lowers the rectal temperature for about an hour (Dujardin-Beaumetz).

Therapeutics.—Ichthyol is not only peculiar in its origin, but in that it possesses so many widely-different therapeutic properties. We would naturally infer that its use would be indicated in a large variety of ailments and disorders. This we find to be true. Although not a panacea, it has established itself as one of the most valuable therapeutic aids at our command.

Ichthyol can be used pure or dissolved in any of the usual solvents.

It can be administered internally in substance, in pill, capsule, or watery solution (adding some essential oil to cover the taste).

It can be used externally, or topically, in spray, by inhalation or gargle, in ointment, in suppository or on tampons, in water or oily solutions, or as a varnish (dissolved in collodion or in traumatizin).

To produce an impermeable layer of ichthyol, which can be easily and quickly removed without irritating the skin, the writer uses the following: Ichthyol, 40 parts (by weight); starch, 40 parts; concentrated solution of albumin, 1 to 1½ parts; water, enough to make 100 parts. The constituents must be mixed in definite order; the starch must be moistened with the water, the ichthyol then rubbed well in, and, finally, the albumin must be added. The concentration may be regulated by the thickness of the layer, the first application being wiped off with a moist cloth, so as to have the finest possible coating. An ichthyol-carbolic-acid varnish having the same properties can be made in a similar way, with the omission of the albumin. The formula is: Ichthyol, 25 parts; carbolic acid, 2.5 parts; starch, 50 parts; water, 22.5 parts. The ichthyol and carbolic acid are dissolved in

the water with gentle heat, and the starch then added. The first preparation, "vernix sum ichthyoli," is recommended in acne when the skin is irritable, rosacea seborrhœica and rosacea simplex, in "ulerythema centrifugum," in intertrigo, "tubercular" eczema, seborrhœic eczema, and in erysipelas. Unna (Brit. Jour. of Derm., Apr., '91).

Ichthyol, when given by the mouth, may be increased to 15 grains a day. Locally, it may be mixed with lanolin, zinc ointment, or glycerin, varying in strength from 5 to 50 per cent. For a regenerative action, the weak ointments are better; for a resolvent action, as in gout, rheumatism, and neuralgias, the strong ones are recommended. T. Cranstoun Charles (Lancet, Sept. 26, '91).

When applied externally, previous washing (except when contra-indicated, as in eczema) of the afflicted parts each time, with soap and warm water, and gentle drying are advised. After the painting, inunction, or embrocation, it is best to cover the parts with carded cotton or flannel, and apply over all rubber cloth or rubber tissue, to prevent evaporation, repeating the process night and morning. To avoid staining the clothes, ichthyol may be applied pure and then dusted with French chalk to form a crust, the usual dressings being afterward applied. The odor of ichthyol may be disguised, if desired, by the addition of a small quantity of vanillin or cumarin or of the oils of citronella, eucalyptus, or turpentine.

The remedy can be administered by subcutaneous injection in weak, watery solutions (1 to 3 per cent.), but if not freshly prepared the solution must be previously sterilized by boiling for a short time before using. For the hypodermic injection of exudates and tumors, solutions as strong as 50 per cent. have been employed.

The stains upon the clothing and bed-linen, soiled during the application of

ichthyol, may be removed by boiling in soap and water, or by washing with soft soap, if attended to at once.

RHEUMATISM.—Ichthyol is useful in all forms of rheumatism. Its application in these cases is followed by a prompt relief or cessation of the pain, and a diminution of the swelling, redness, and febrile action. Dressings kept constantly moist with a watery solution (10 to 20 per cent.) of ichthyol have proved of great value in acute arthritis, muscular rheumatism, lumbago, sciatica, and gout.

If an ointment be preferred the following may be used:—

℞ Ichthyol, 2 to 4 drachms.

Oil of citronella, 15 to 30 drops.

Lard, vaselin, or lanolin, 1 ounce.

—M.

In acute cases this may be gently rubbed over the affected parts and a piece of linen (lintine) spread with the above applied. This is to be covered with cotton and bandaged firmly. In subacute or chronic cases the ointment is best rubbed in well before applying the cotton and bandage. Ichthyol in olive-oil (1 to 3) may be used in the same way. The effect of these applications, especially in subacute and chronic cases, may be heightened by giving ichthyol-sodium (2 to 6 grains) internally, two hours after meals, either alone or combined with an equal quantity of sodium salicylate.

After several days the stomach can tolerate $\frac{1}{2}$ to $1\frac{1}{4}$ drachms of ichthyol. Therapeutic action is largely due to the 15 per cent. of sulphur which it contains. Vigier (*La Semaine Méd.*, Feb. 18, '91).

Ichthyol recommended hypodermically, as it possesses, under these circumstances, analgesic properties. Particularly is it of value in cases of neuralgic pains associated with inflammatory processes which have caused exudations. Damines (*Thèse de la Faculté de Paris*, '92).

PERITONITIS.—In peritonitis ichthyol is best applied pure, with a brush, over the whole abdomen. The abdomen is covered by cotton, and that again by rubber tissue or thin rubber cloth to prevent evaporation. Pain, tenderness, tympanites, and fever subside under this treatment.

PHTHISIS.—Scarpa treated a series of 150 cases of tuberculosis with ichthyol, giving 20 to 200 drops daily of a watery solution of the pure drug (1 to 2) with the following results: 23 deaths; 17 apparently cured; 50 notably improved; 32 some improvement; 28 not improved. The beneficial action of the remedy was manifested first in the relief of the cough, expectoration, and dyspnoea, and later by an improvement in the general condition.

Ichthyol recommended in pulmonary tuberculosis. It is cheaper than creasote, and in many cases is better borne. The writer has used it during the past two years in more than 100 cases with good results; particular attention called to the remarkable effect it has on nutrition. He prescribes a mixture of equal parts by weight of ichthyol and water, and directs 4 drops to be taken t. d., before meals if it can be borne; if not, after meals. A little black coffee helps to cover the taste. The dose must be gradually increased by a drop daily, until 40 drops are taken at once; it should always be taken well diluted with water. The full dose must be continued for a long time. Cohn (*Lancet*, i, 1521, '94).

In the treatment of pulmonary tuberculosis, dry catarrh, purulent catarrh, bronchial dilatation with fetid expectoration, acute bronchitis, best effects obtained from employment of ichthyol. In numerous cases of tuberculosis the use of guaiacol or creasote was alternated with that of ichthyol for several months with excellent results. It was employed in capsules containing 4 grains each and covered with a coating which enabled the capsule to pass through the stomach into the intestine without becoming dis-

solved. From 4 to 8 capsules a day were taken at meal-times. In two-thirds of the cases there was an increase in weight. M. le Tanneur (Gaz. des Hôpitaux; Revue Méd., Jan. 5, '98).

Ammonium ichthyolate found serviceable in chronic pulmonary tuberculosis as the sole remedy in cases in which the hygienic surroundings of the patient could not be improved. Of thirteen cases, eleven were distinctly improved, and only two failed after prolonged treatment to show beneficial results. At the end of the first month of treatment the cough was found to be less severe in the majority of the cases, and all of the cases showed improvement at the end of the second month. In eight of the cases the expectoration became less in amount, but at the end of two months night sweats were complained of to a greater or less extent. At the end of six months all of the cases had gained in weight.

The drug is given in capsule form, each containing 4 grains of ichthyol. As a rule, a case may be given two capsules four times a day, the amount being gradually increased until five capsules are taken four times daily, this being the limit. J. Burnett (Lancet, Aug. 8, 1903).

GYNÆCOLOGICAL DISORDERS.—In these disorders ichthyol has been used on account of its anodyne properties, its resolvent and absorptive action, and its kolyseptic powers. It has been found useful in removing periuterine and pelvic exudates, in the treatment of chronic metritis, inflammatory condition of the tubes and ovaries, erosion of the cervix uteri, leucorrhœa, and pruritus of the genitals. The remedy is used internally in pills ($1\frac{1}{2}$ grains), at first 3 daily, later 6. Locally, a mixture of ichthyol, 1 drachm, and glycerin, $2\frac{1}{2}$ ounces, may be applied on cotton tampons. The remedy may also be rubbed in over the abdomen in ointment with lanolin (equal parts), or combined with soft soap (1 to

8). Suppositories containing 1 to 4 grains of ichthyol may be administered *per vaginam*. Ulcerations and erosions may be painted with pure ichthyol. For leucorrhœa lavage with a watery solution (5 to 10 per cent.) or a 5-grain suppository may be used night and morning, preceded by a copious hot-water irrigation.

Ichthyol is superior to the nitrate of silver, creolin, and carbolic acid in the treatment of various inflammatory disorders of the female genitalia. The best preparation for injections is a 10-per-cent. solution of the drug in glycerin. Richard Bloch (Jour. de Méd. de Paris, May 10, '91).

One hundred and fifty cases of women suffering from various affections, 142 being of the genital organs, treated by ichthyol. Tampons saturated with glycerole of ichthyol (10 per cent.) were used, and the drug was administered internally at the same time in pills of $1\frac{1}{2}$ grains, from 1 to 6 daily being taken. The disagreeable odor may be disguised by a 1- or 2-per-cent. essence of citronella or essence of eucalyptus. Of 22 cases of inflammation of the uterus there were 12 cures, 9 were improved, 2 failures; of 120 cases of periuterine inflammation, 59 recoveries, improvement in 56, 5 failures; 2 cases of fissure of the breast, rapid cure; 6 cases of inoperable cancer, considerable diminution of the fœtid secretion. R. Hermann (Inaugural Dissertation, '92).

Fifty-per-cent. dilution with glycerin is the best for the congested states of the female pelvic organs. A. D. Sinclair (Boston Med. and Surg. Jour., Feb. 8, '94).

The pure drug found most satisfactory and reliable in congested states of female pelvic organs. Storer (Boston Med. and Surg. Jour., Aug. 2, '94).

Ichthyol, owing to its analgesic, antiseptic, antiphlogistic, and resolvent action, may render real service in gynæcology if its employment is judiciously associated with other therapeutic measures, according to the indications. Lorain (Jour. de Méd. de Paris, Mar. 28).

GENITO-URINARY DISORDERS. — In acute cystitis the lower part of the abdomen may be painted with ichthyol, pure or in a 30-per-cent. ointment, to relieve the pain. The bladder may then be irrigated five or six times daily with a warm (86° F.), aqueous solution (2 per cent., increasing to 5 per cent.). In chronic cystitis a warm 1-per-cent. solution may be used once daily.

Gonorrhoea is amenable to urethral injections of a watery solution (1 to 3 per cent.) of ichthyol. Neisser states that a 1-per-cent. solution will destroy gonococci.

Ichthyol regarded best-known remedy for genito-urinary affections of blennorrhagic origin. The writer used it in 110 cases, 80 of which were men affected with blennorrhagia in various stages, and 30 were women showing inflammation of all parts of the genital apparatus. The men were given urethral injections of an aqueous solution (1 to 4 per cent.), while tampons, soaked in 10-per-cent. glycerole of ichthyol, were introduced into the vagina of the female patients. The results were brilliant. Only 7 of the men were not cured, though improved, the rest leaving hospital entirely recovered after a treatment of from fifteen to thirty days. The women were cured without exception. P. Colombini (*Commentario Clin. delle Mal. Cut. e Genito-Urin.*, Nos. 5, 7, '93).

Use of ichthyol strongly advised in acute urethritis, a 2-per-cent. aqueous solution being injected from five to six times daily, gradually increasing the strength to 5 per cent. As the patient improves, the number of injections are diminished to one in the morning and one in the evening. In acute cystitis the writer applies 30-per-cent. ichthyol ointment to allay pain, and after the acute period employs irrigation, injecting about one quart of a 1/2-per-cent. aqueous solution of ichthyol twice a day for a few days and then once a day. In chronic cystitis he injects, once daily, a 1-per-cent. solution of ichthyol. Villetti

(Report of Inst. of Exp. Pharm. of the Royal Univ. of Rome, '94).

In cases of primary and secondary catarrh of the bladder the writer washes out the viscus with 1/2- to 1-per-cent. solutions of ichthyol. By this means pain was relieved, micro-organisms were destroyed, and ammoniacal fermentation prevented. Colosanti (*Riforma Medica*, Jan. 12, '94).

Ichthyol employed with success in the blennorrhagic urethritis of women. R. Coltman, Jr. (*Univ. Med. Jour.*, Mar., '94).

Ichthyol in hot solutions, for urethral use (0.5 to 2 per cent.), is very valuable in acute urethritis, especially in those cases where the mucous membrane is very sensitive. In subacute urethritis, where the lesions are circumscribed, local applications (with the aid of the endoscope) render great service. Ichthyol suppositories, in the majority of cases, cause the inflammatory symptoms to disappear in the course of a prostatitis. In chronic urethritis, with infiltration, ichthyol by itself is inefficacious, but associated with the mechanical treatment, or alternating with it, it appears to be of great benefit. Administered internally, it does not have any beneficial effect on nephritis or pyelitis. H. Lohnstein (*Therap. Monats.*, Apr., '94).

In vulvar pruritus of pregnant women ichthyol found valuable after other methods of treatment had failed. The strength of the ointment used was about 2 drachms to the ounce. Doisey (*Jour. des Praticiens*; *Ther. Gaz.*, Mar. 15, '99).

Ichthyol as a laxative, used in fifty women suffering from various inflammatory affections of the genitalia, accompanied by constipation and dyspepsia. It was given in pills of 3 grains each, once, twice, or thrice a day. The constipation was overcome without colicky pain or diarrhoea. It should be given in keratin-coated pills. Gunsburg (*Northwestern Lancet*, Feb. 15, 1900).

In prostatitis the injection of a small syringeful of a 10-per-cent. solution by the rectum three or four times daily relieves the pain and causes a marked reduction in the size of the swelled gland.

CUTANEOUS DISORDERS.—Ichthylol is especially useful in skin affections associated with atony and induration of the deeper layers of the skin and in which pain or inflammation exists.

In acne Unna advises the use of a 50-per-cent. watery solution of ichthylol, well rubbed in on retiring, and washed off with warm soap-water in the morning; during the day a weak solution of bichloride of mercury is used. In addition to the external use of the remedy, Unna advises the internal use of it, in doses of from 8 to 30 grains daily.

In rosacea, with tendency toward eczema, mild applications are used externally; in forms tending toward acne the remedy may be applied freely. In nervous eczema ichthylol should be used internally and externally. For erythema multiforme and lichen urticatus Unna advises external applications of pure ichthylol or of strong solutions. In intertrigo a 10-per-cent. salve or watery solution is beneficial; in eczema marginatum, the same is advised, with the addition of from 2 to 10 per cent. of salicylic acid. Ichthylol is also used with advantage in the chronic stages of keloid and lupus. In the latter Unna recommends the following:—

℞ Bichloride of mercury, 1 to 4 parts.
Sodium ichthylol-sulphonate, 5 to 10 parts.
Distilled water, enough to make 100 parts.—M.

Ichthylol is of decided benefit in both acute and chronic urticaria, and also in chronic alcoholism, in which the tremor rapidly disappeared, the appetite returned, and sleep became normal and undisturbed. The depression and chronic gastric catarrh were likewise greatly diminished by the drug. Good results were also observed in chronic rheumatism, administered internally and with local applications. In arthritis defor-

mans the pain was greatly lessened. Nils Gadde (Therap. Monats., Mar., '90).

Following paste recommended in eczema of the female genitals:—

℞ Ichthylol, 1½ to 2 parts.
Powdered starch,
Flowers of zinc, of each, 12 parts.
Vaselin, 25 parts.

Von Sehlen (Monats. f. Prakt. Derm., July, '94).

The efficacy of ichthylol is not increased by the addition of lanolin, but is materially augmented by rubbing. H. A. Hare (Boston Med. and Surg. Jour., Oct. 15, '94).

Ichthylol given internally is an effectual remedy for certain forms of urticaria caused by errors of diet. Lanz (Rev. Méd., Oct. 21, '94).

Itching, which is so often found in connection with eczematous conditions of the anal and genital regions, can be greatly relieved by the use of an ichthylol wash ranging in strength from 1 to 2 drachms to the ounce of water. Cantrell (Phila. Polyclinic, Apr. 4, '96).

The variola ichthylol is an ointment composed of 10 parts of ichthylol to 60 of fat and 20 Sanoli's olive-oil, chloroform, or glycerin. The ointment should be rubbed in three times a day as soon as the papules become visible. Cassenکو (Brit. Med. Jour., June, '97).

In erysipelas ichthylol has proved of great value. It reduces the congestion, tension, swelling, and pain, and appears to limit the extension of the disease. The thickness of the skin determines, in a measure, the strength of the application to be used. The surface is carefully washed and dried, and a salve (30 to 50 per cent.) made with lanolin or vaselin gently rubbed in. For use on the lower extremities Unna advises the following: Ichthylol and ether, of each, 1 part; collodion, 2 parts. Another formula is ichthylol, 2 parts, with ether and glycerin, of each, 1 part. Instead of the foregoing, a watery solution (1 to 3) may be applied two or three times daily.

In erysipelas experience with a 30- to 50-per-cent. ichthyol ointment has confirmed the value of the remedy. Spread on rags and used to cover the affected area and extend a little beyond, this ointment cured 4 cases of facial erysipelas in two or three days and 5 other cases in five or six days.

In burns and frost-bites good results obtained with ichthyol. The internal use of ichthyol as a reconstitutive and tonic is of great value in anæmic dyspeptic subjects suffering from eczema. Kopp (Münch. med. Woch., Aug. 27, Sept. 3, '89).

In erysipelas the affected parts to be painted morning and evening with collodion, to which ichthyol has been added in the strength of 10 per cent., the application being made so as to cover the healthy skin for an extent of three centimetres around the affected patch; the application is always made from healthy to diseased skin. In eighty cases in which the author has used this method it has not failed once. When the varnish comes away the skin is left in a healthy condition. Victor Cebrian (El Siglo Med., Dec. 17, '93).

The ichthyol preparations (ammonium and sodium) in weak solution in a short time destroy the pyogenic and erysipelas streptococci. Ichthyol is used with success in the suppuration from these cocci. The staphylococcus aureus and albus, the bacillus pyocyaneus, the bacillus of typhoid, ozæna, and anthrax, and the spirillum of Asiatic cholera show more or less resistance to ichthyol. The diphtheria bacillus in fresh colonies is easily destroyed by weak ichthyol solutions, while mature ones are acted upon with difficulty. Ichthyol has rendered good service in the treatment of typhus and ozæna. It is recommended that it should be preserved only in substance or in a 50-per-cent. solution; weaker solutions may be culture-mediums for micro-organisms, as the staphylococcus aureus. Weak solutions should be sterilized by heat. Rudolf Abel (Centralb. f. Bak. u. Parasitenk., No. 13, '93).

In burns of the first and second degrees strong applications are made and

a subsidence of pain and congestion follows. Pure ichthyol painted on, or the use of an ointment composed of equal parts of ichthyol, zinc oxide, and vaselin, produces a happy effect.

In burns of the first degree is used a mixture of 5 parts of zinc oxide, 10 parts of carbonated magnesium, and from 1 to 2 parts of ichthyol. In burns of the second degree the following composition employed: 5 parts of zinc oxide; 10 of prepared chalk; 10 of starch; 10 of linseed-oil; 10 of lime-water; and from 1 to 3 of ichthyol. This material is applied once daily. When there is a great deal of inflammation in the burn these two preparations can be used at the same time, the burn being first dusted with the powder, and the paste being laid on over this. Leistikow (Semaine Med., xv, p. 487, '95).

In frost-bite Lange recommends the use of ichthyol in olive-oil (3 to 20) used as a paint; Heuss advises ichthyol in camphorated oil (1 to 4), rubbed in once or twice daily, and covered with cotton.

In chilblains (pernio) the use of an ointment of ichthyol (10 to 30 per cent.) or of equal parts of ichthyol and turpentine is attended with good results. Unna advises the use of a mixture of ichthyol, 5 parts; chloroform, 2 parts; and petrolatum, 3 parts, to make an ointment. If the skin is broken the chloroform is omitted and zinc ointment replaces the petrolatum with advantage.

In furunculosis solutions or ointments (10 to 50 per cent.) are equally efficient, the inflammatory symptoms usually subside, and, if applied sufficiently early, ichthyol will abort the boils. With the external treatment it is well to give calcium sulphide in $\frac{1}{4}$ -grain doses every two or three hours for twelve hours, and then three or four times a day as suggested by C. J. R. McLean.

In prurigo and pruritus the application of ichthyol in a 5- to 10-per-cent.

watery solution, after washing with warm water and soap, has given excellent results. Lange advises a mixture of ichthyol, 2 parts, in absolute alcohol and ether, each, 9 parts; to be used as a paint or by inunction.

WOUNDS AND INJURIES.—Incised and post-operative wounds dressed with pure ichthyol heal by first intention. Cracked nipples heal well under a 20-per-cent. ointment, but it must be wiped off before nursing. Fissure of the anus and other anal lesions do well under the use of pure ichthyol applied by means of a camel's hair pencil morning and evening and after defecation.

Ichthyol considered as the most valuable drug in the treatment of anal fissure. A brush is impregnated with the pure drug, and thus introduced into the anus, and the contraction of the sphincter-muscle forces it into all the folds of the mucous membrane. This treatment is assisted when necessary with castor-oil. Van der Milligen (*Monats. f. Prakt. Derm.*, '95).

Venomous insect-stings should be treated by the application of pure ichthyol, or a mixture of equal parts of ichthyol and lanolin. If, when the surgeon first calls, swelling already exists, ichthyol is applied, sheet India rubber is laid over this, and an ice-bag placed on the India-rubber tissue. Administration internally in such a case of 10-drop doses of a mixture of equal parts of ichthyol and spirit of ether advised. Ottinger (*N. Amer. Pract.*, Feb., '97).

Sprains and painful injuries about the joints do well under ichthyol; it should be well rubbed in, on the surface of the injured parts, covered with cotton, and a bandage firmly applied.

MISCELLANEOUS DISORDERS.—The painfulness of parotitis subsides rapidly when the parts are anointed with ichthyol-lanolin (1 to 2 per cent.) and covered with cotton. In many cases undiluted ichthyol is indicated. (Lange.)

It is an efficient remedy in almost all affections of the mucous tract.

Inhalations by means of an atomizer of a cold 2-per-cent. solution of ichthyol repeated twice daily, and not too deeply inspired, have given excellent results in acute laryngitis. No ill effects have followed. Ciegiewicz (*N. Y. Med. Jour.*, vol. lxxvii, p. 826).

Two-per-cent. solution of ichthyol recommended as a gargle in anginas of almost every kind, except the follicular variety. The mouth and throat are to be carefully gargled, and a portion of the solution then swallowed. L. Herz (*Wiener med. Woch.*, No. 2, '93).

Ichthyol ointment, 2½- to 10-per-cent. solution, advocated in the treatment of scrofulous blepharitis. Luciani (*Ann. di Ottal.*, xxiv).

Ten- to 15-per-cent. ointment of ichthyol in lanolin is very efficacious in ciliary blepharitis. Germani (*Gazz. degli Osped.*, June 20, '96).

Ichthyol in pills (¾ to 3 grains in twenty-four hours, rapidly increasing the dose to 10 or 15 grains in the day) is one of the most valuable remedies in whooping-cough. Maestro (*Med. Week.*, iv, '96).

In a case of acute idiopathic oedema of the epiglottis in a man of 41, a spray of ichthyol, 1/8 per cent. in ice-water every fifteen minutes, with ice externally, gave rapid relief. W. P. Meyjes (*Jour. Laryn., Rhinol., and Otol.*, Mar., '97).

Pure undiluted ichthyol tried in furunculosis. It was thickly painted on the furuncles, which rapidly became softened and soon afterward burst. Every day the old ichthyol is washed off and a new layer applied, after washing away the pus. The same method was equally successful in syccosis barbæ and folliculitis of the scalp. Several cases of impetigo vulgaris, ecthyma, and eczema impetiginosum were also treated very satisfactorily with pure undiluted ichthyol. Menahen Hodara (*Monats. f. Dermat.*, 1901; *Merck's Archives*, March, 1902).

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ICTERUS. See JAUNDICE.

IDIOCY. See INSANITY.

INDICANURIA.

Definition.—Indican, in small quantities, is a usual constituent of the urine; under certain circumstances, however, the amount is so large as to merit the designation of indicanuria.

Symptoms.—Normal urine contains very small quantities of indican; about 0.0045 to 0.0195 gramme are excreted in twenty-four hours; different animals secrete much more, horses about twenty times as much. Urine containing much indican is dark colored, brown to black; in rare cases indigo is deposited as a blue powder.

The presence of indican in excess in the urine is demonstrated by different tests.

1. **HELLER'S TEST.**—By the addition of nitric acid a blue-violet ring is formed on the point of contact of acid and urine.

2. **JAFFE'S TEST.**—Equal volumes of urine and hydrochloric acid are mixed in a test-tube; a few drops of a solution of sodium hypochlorite are added and the mixture is shaken. The blue color of indigo will then appear. Stokvis proposes to add some drops of chloroform, in which the indigo dissolves.

[Richardson (Med. News, '95) proposes to substitute a solution of hydrogen dioxide to the solution of hypochlorite of soda, contending that the reaction takes place more rapidly and that the color is more distinct. F. LEVISON.]

Senator modified Jaffe's test in the following manner: Ten to 15 centimetres of urine are mixed with an equal quantity of concentrated hydrochloric acid; 3 to 5 cubic centimetres of chloroform and 1 drop of saturated solution of chlorinated lime are added and the mix-

ture is shaken. The chloroform is colored blue when indican is present in excess.

Obermayer's Test.—The urine is precipitated by the addition of a solution of acetate of lead; the filtrate is treated by the addition of concentrated hydrochloric acid and a few drops of a 2 to 4 per 1000 solution of perchloride of iron; the mixture is shaken with chloroform.

Quantitative tests have been indicated by Jaffe and Salkowski, advantage being taken of the bleaching powers of hypochloride of calcium, a standard red solution of this salt being used to effect the complete decoloration of the indigo.

Etiology.—By the decomposition of proteids indol is formed, which is absorbed in the intestine and oxidized in the blood, forming indoxyl. When excreted in the urine it is combined with sulphuric acid and excreted as indoxyl-sulphuric potassium-indican. This salt may be isolated as rhomboid, white crystals, which are soluble in water and hot alcohol, hardly soluble in cold alcohol, and not at all in ether; by heating it with hydrochloric acid it is divided into sulphuric acid and indoxyl, which in presence of oxidizing substances gives indigo. By fermentation of urine containing much indican, indigo is also formed.

In some cases indigo-red also is formed by heating the urine with nitric acid. Rosenbach (Berliner klin. Woch., '89 and '90).

Indicanuria probably indicates defective proteolysis, and is often found in conjunction with uroerythrinuria. If the uroerythrinuria is constant and unaccompanied by indicanuria, it probably indicates hepatic disease; but if indican is present, the hepatic trouble is more likely to be functional. Indican is not necessarily due to putrefactive changes in the intestine, but may result from the mere breaking up of albumin. Indicanuria may also be present from altered

tissue-change, and is a fairly constant symptom in arthritics. Reale (*La Clin. Mod.*, An. v, p. 22, 1900).

During the oxidation of indoxyl, there are produced not only indigo-blue, but also red and brown substances. The rapid oxidation results in indigo-blue, while the slow oxidation results in indigo-red. The authors obtained a positive indigo-reaction in the cases of the urines of horses, dogs, rabbits, guinea-pigs, and also human beings. In their opinion indican is a normal constituent of urine and consequently indicanuria loses in significance as a diagnostic sign. C. Porcher and C. Hervieux (*Hoppe-Seyler's Zeitsch.*, July 31, 1903).

Indicanuria is ordinarily dependent on decomposition of the intestinal contents consequent upon constipation or occlusion of the intestinal tract, especially of the small intestine, while occlusion of the large intestine does not cause it. In the conditions of hunger the albuminous secretions of the bowels are decomposed and form indol; newly-born infants do not produce indol, because their intestines do not contain bacteria.

[Gehlig (*Jahrbuch f. Kinderh.*, '97) found that nurslings in good health only present traces of indican in the urine. When digestive troubles occur the quantity of indican is augmented. F. LEVISON.]

Indicanuria regarded as of real importance in children. It exists in normal urine, but in such small quantity that indicanuria may be regarded as pathological, especially in children in whose food there is less nitrogen than in that of adults. Indican being a derivative of indol, indicanuria is particularly met with in cases in which there is a hyperproduction of indol, as in acute and chronic affections of the digestive tract and in certain acute diseases, such as typhoid fever, pneumonia, severe chorea, etc. It is constant in tuberculosis, with which it is in direct relation. Djouritch (*Revue Men. des Mal. de l'Enfance*, Feb., '94).

Infants nourished with sterilized cows' milk show, at times, small amounts of

indican in the urine, even if the digestion is normal. In case of digestive derangement indican is almost always present, the amount increasing with the intensity of the derangement. In older children with normal digestion the presence of small amounts of indican in the urine is the usual condition, as well as in adults. This excretion is increased after the ingestion of food rich in nitrogenous matters, particularly meat and eggs. No relation between tuberculous disease and increased elimination of indican could be determined. Gehlig (*Jahrbuch f. Kinderh. und physische Erziehung*, Aug. 6, '94).

Indican is found in cases of decomposition of pus, as in putrid empyema, putrid suppurations, etc.; it has also been observed in different diseases, especially of the stomach and the bowels, carcinoma of the stomach, gastric ulcer, acute and chronic gastric catarrh, cholerae nostras and Asiatica, peritonitis, etc.

[Simon (*Amer. Jour. Med. Sci.*, '95) states that a relation exists between indican and the acidity of the gastric juice in the sense that a subnormal amount of free hydrochloric acid calls forth an increased degree of intestinal putrefaction, and, therefore, an increased formation of indol. F. LEVISON.]

Indican found in the urine of typhoid and other forms of fever and in faecal toxæmia. Churton (*Lancet*, Aug. 24, '89).

In a series of experiments the quantity of indican in the urine, under a purely albuminous diet, was enormously increased in patients with affections of the spleen and in dogs whose spleens had been removed. This would tend to indicate that the spleen has the function of checking the processes or eliminating the products of albuminous decomposition in the intestine. Mazzetti (*Wiener med. Woch.*, Aug. 1, '91).

Presence of indol and indican almost constant in the liver affected with various lesions, much less frequently in the kidneys, spleen, lungs, and heart. The greater frequency of their presence in the liver is explained by the fact that this

organ, being on the route of the supra-hepatic portal circulation, is one of the store-houses of the indol developed in the intestines. F. Villard (Marseille-méd., June 15, '95).

The constant elimination of five millogrammes of indican in adults, or even less in children, is pathological. The excess depends upon the increased putrefaction of albumins or deficient altered activity of the bile and pancreatic secretions. In such case flatulence occurs, and the whole condition may be benefited by change of diet. In other cases there is continuous cause of indican with or without flatulence, uninfluenced by diet. Herter and Smith (N. Y. Med. Jour., June 22 to July 20, incl., '95).

The introduction of large numbers of colon bacilli into the intestines increases the indican and the ethereal sulphates of the urine. The introduction of large numbers of the proteus vulgaris may increase the ethereal sulphates, but not perceptibly. The introduction of the lactic-acid bacillus may reduce markedly the indican and ethereal sulphates. Herter (Brit. Med. Jour., Dec. 25, '97).

Indican has been recognized as a symptom of tuberculosis.

In the urine of healthy children and those suffering from simple dyspepsia indican was very rarely found. In grave forms of diarrhœa it was almost invariably found; but when the diarrhœa was mild it appeared less often and in smaller quantities. In tuberculosis it was always present. The author believes it due to the decomposition of milk-albumin. Hochsinger (Wiener med. Woch., Apr. 18, '91).

Indicanuria cannot be considered as of significance in the diagnosis of tuberculosis in children. Giarre (Lo Sperimentale, p. 98, '93).

It must, nevertheless, be borne in mind that ingestion of large quantities of nitrogenous food is apt to lead to indicanuria even if no derangement of the digestion be present.

Series of cases showing various conditions of the stomach-contents in which

indicanuria was looked for. As far as indicanuria is related to the stomach, one must take into account the amount of combined chloride present and the degree of gastric digestion of proteids. The presence of combined free HCl is important in preventing indicanuria. But the gastric secretion is not alone an important matter. One must always consider the condition of the intestines, particularly the amount of bile and pancreatic secretion. Jones (N. Y. Med. Jour., Apr. 28, 1900).

In different diseases of the nervous system, especially after epileptic fits, an abnormal quantity of indican has been noticed in the urine.

Increased indican in the urine is shown to be a manifestation of catatonic and epileptic stupor, of the akinetic (depressed) forms of dementia præcox and general paralysis, also of alcoholic depression, and of the depressed phases of maniac-depressive insanity (*folie circulaire*). There is no proof that either the hyperindicanuria or the depressed akinetic state of the nervous system is due to intestinal autointoxication. Most of the observed cases of indicanuria were upon a fixed routine diet—many of them upon milk alone; their bowels were carefully regulated, and some of them were getting salol. A striking parallelism exists between excessive indican elimination and various akinetic disorders entirely independent of the form of mental disease. The appearance of both acetone and diacetic acid in the urine can be referred to an abnormal metabolism, due to inanition processes which are usually associated with depressed or akinetic states, for in cases of stupor or depression, where there was no decline in body-weight, both substances were almost constantly absent. J. H. Coriat (Amer. Jour. Insanity, April, 1902).

In chronic cystitis indican may be decomposed in the bladder and indigo deposited from the urine as a blue powder.

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INFANTILE MYXEDEMA (CRETINISM).

Definition.—Cretinism is a chronic disease of nutrition due to loss of, or impairment of, function of the thyroid gland, and appears at any time between birth and puberty; after puberty it is known as myxœdema. It causes retardation of development in the sensory, motor, and trophic nervous systems, leading to a retention of an infantile state, and to an extraordinary disproportion between the different parts of the body—the brain, bones, skin, mucous membranes, and generative organs suffering most.

Symptoms of cretinism are to be explained as the result of the myxœdematous process in the undeveloped tissues of an infant. A scientific application of the principles of heredity by such methods as have been used in such subjects as deaf-mutism, idiocy, and other nervous diseases will demonstrate similar relations and yield similar results in cretinism. William B. Noyes (N. Y. Med. Jour., Mar. 14, '96).

Symptoms.—These depend to a greater or less extent on the length of time the disease has lasted, and the age at which the affection has developed, but mainly on the degree of involvement of the functions of the thyroid gland. Girls are more often affected than boys, though the difference in proportion is not very large, but the symptoms, aside from the sexual organs, are in both sexes the same, and are characteristic in every pronounced case. The disease may vary much in intensity, but even in the less marked cases diagnosis is seldom difficult, when all the symptoms of abnormal development are carefully sought and studied. Cretinism differs from most other diseases in that it is to be recognized by signs rather than by symptoms; the most prominent alterations concern the surface of the body, and are

thus readily visible; so that the oversight of a case by a physician familiar with the disease is nearly impossible. When the disease has commenced at birth or very early in infancy, it is seldom recognized before the child is six months old, although it has been diagnosed as early as the sixth week. It may, however, develop *in utero*. After the sixth month the symptoms begin to become prominent; it is noticed that the child does not grow as rapidly as it should, that it is not as bright mentally as is usual, that its tongue is too large for its mouth, and lolls out between the teeth. The tongue may be so large as to impede respiration when the child lies on the back, and pieces of the tongue have even been excised through mistaken diagnosis.

On further examination it is seen that the skin all over the body instead of being soft, and of normal color, is thick, swelled, dry, and scaly. Nowhere, or only to the slightest degree, does it pit on pressure; it lacks the glistening waxy look of œdema due to renal disease. In a very exceptional case reported by Ruhrah, the œdema was not general, but affected certain parts alone of the body.

The desquamation may be furfuraceous, like that of measles, or it may more closely resemble that of scarlet fever. The hair is apt to be thin and coarse, and in older children may be lacking in parts where it is always found under normal conditions, as in the axillæ and on the pubes. Even in infants it will be noticed that the eyebrows and eyelashes are very scant, and perhaps altogether lacking.

Thick hair has been noticed in some cases, but this is certainly exceptional. The face has a false look of old age, and sometimes has a distinct toad-like aspect. The eyelids are puffy and

swelled, leaving but a narrow slit through which the eyes can be seen. The nose is depressed between the eyes, and the *alæ nasi* are thick, thus making it seem still more flat, from the external width of the nostrils. The ears also suffer from the same thickening, and stand out from the head. The lower lip, partly due to the lolling tongue, is everted and swelled. The teeth, if there are any, are irregular, ragged, and decayed; the second teeth often do not appear at all, or are much delayed in coming through, and are then, like the first, diseased, and of abnormal shape and size, although there is nothing distinctively characteristic in their form. The abdomen is swelled, and there is often an umbilical hernia, though this is seldom of large size. The back is arched and there may be more or less curvature of the spine.

The limbs are short and stunted; so that the thick skin lies in folds on the arms and legs and on the face (forehead) as well. The hands and feet are undeveloped, pudgy, and look like those of a pachyderm; fingers and toes are immobile, with a tendency to stand apart, as a result of the morbid condition of the skin. The nails are short, brittle, often striated, either longitudinally or vertically; they lack the normal glossy appearance. The child is distinctly pale, although there may be some suffusion of the cheeks. The fontanelles remain patent long beyond the normal term. All the muscles of the body are weak; the child cannot support itself, and the overlarge head droops forward, so that the chin may rest on the chest. Goitre, which is common in the endemic form, is only occasionally seen in the sporadic cases, though usually the thyroid gland cannot be palpated. In the supraclavicular regions large masses of fat are sometimes seen, which with the thick,

wrinkled skin may form a sort of collar; so that the head seems to be supported, as artificially done in high cervical caries, with a Thomas collar.

The mental condition of the child is as ill developed as the physical; the patient is apathetic, sits about with apparently no interest in any person, not even recognizing his parents or objects about him. If the child attempts to walk, the movements are slow; there is more or less inco-ordination, owing to the general paresis of the muscles; but there is no paralysis; the deep reflexes are present but commonly weak. The face is immobile, there is dullness of expression and action; the child makes no attempts to walk, talk, read or write, and does not answer questions readily.

The child exhibits no desires except, perhaps, for food, and manifests its hunger or thirst by inarticulate cries. There is often a distaste for meat, but the appetite may be voracious. Constipation is usually present. Abnormal sensations are not common, and there is usually retardation in the sense of pain; headache is not complained of. The cretin is usually good tempered and does not cry. The child has to be fed with a spoon and almost altogether with fluid or semifluid food, for the mucous membranes from the mouth to the rectum are apt to be swelled; these undergo changes similar to those of the skin.

Memory is deficient, and speech is slow, thick, and hoarse. Although idiots, their idiocy is not such as one sees in cerebellar sclerosis: they have no tics, no epileptoid movements; they do not make faces; do not grit their teeth, and do not masturbate. Infants and young children, as in so many other affections, often suffer from convulsions, but these are in no way pathognomonic.

There is no sweating, and no secretion

from the sebaceous glands, but there is constant drooling from the wide-open mouth, and there is a secretion of tears. Their temperature is invariably subnormal, and they are always anæmic. They suffer from cold and are subject to sores and ulcers, which do not heal readily. The genital organs are also involved, and show signs of lack of development; the testes and ovaries are small and atrophied. Girls may, however, menstruate, and this profusely, and there is occasionally a tendency to severe hæmorrhage from the uterus, or in both sexes from the nose and gums. The heart, lungs, liver, spleen, and other abdominal organs do not appear to be involved; the kidneys act naturally, though the amount of urine passed, and the percentage of urea and uric acid excreted, may be a little less than normal; a trace of albumin and hyaline casts have been noted in some cases, but these are not persistent and point to no radical organic alterations in the kidneys, but the brain, skin, mucous membranes and bones are invariably affected, usually all of them in about equal degree, though in many cases the body is apparently more diseased than the brain, at any rate as far as can be judged from a study of the mental faculties.

[Combe (Revue Méd. de la Suisse Romande, Anno xvii, Nos. 2 to 6) divides myxœdema in children into three classes, which may be easily recognized by special groupings of the symptoms noted above:—

1. Congenital myxœdema with complete nanism and absolute idiocy.

2. (a) Precocious infantile myxœdema with incomplete nanism and imbecility, the child showing some rays of intelligence. (b) Late infantile myxœdema: merely a backward child, neither idiot nor imbecile, but the intelligence merely less developed than in other children of same age.

3. Abortive ("fruste") myxœdema,

where there is nanism, swelling of integuments, cyanosis, and coldness of limbs, but mobility is preserved, intelligence is almost normal, and there is very slight cachexia.

The same author says further on: "Whether from a clinical point of view or a pathological one these two diseases (myxœdematous idiocy and congenital myxœdema) ought to be united, the one resembling myxœdematous troubles in the formed subject—myxœdema of the adult; the other representing the same symptoms in the as-yet-undeveloped organism of the child—congenital or infantile myxœdema." In this statement we fully concur.

He does not draw any real distinction between cretinism and myxœdema, but divides cretins, in respect to their intelligence, into the following three orders, beginning with the lowest order—the pure idiot:—

1. Cretins. 2. Micretins. 3. Cretinoid state.

1. The cretin proper is *l'homme-planté* (Roesch); his sense of smell and taste is but little developed, and the sense of touch is much diminished; such cretins are apt to die young of epilepsy or cardiac weakness, but may live to be 70 or 80 years old. They lead a purely vegetative life.

2. Micretins are on the intellectual level of a chimpanzee, because the animal can do all that a micretin can. He is "*l'homme-animal*." (Roesch.)

3. The cretinoid state is simply characterized by a retardation of intelligence, by a certain difficulty in comprehension, by a heaviness of mind; it corresponds to the abortive type of atrophic myxœdema.

Such classification may be helpful up to a certain point, but the classes cannot be kept rigidly distinct, the border-line between either two being invisible.

WILLIAM OSLER.]

As in any other disease three orders may be recognized: (1) the very severe, (2) the less severe, and (3) the aborted, so to speak; they should not be separated, but shall all be classed under one main head and recognized as belonging

to one entity. In no one case of cretinism shall we find all the possible symptoms present, and no two cases will exactly resemble one another; but from the symptoms present we can say whether the case is a severe one or not.

[If the two classifications are carefully studied it will be seen that there is no essential difference between them; a patient with congenital myxœdema is a cretin; the micretin is described by the condition of precocious infantile myxœdema, and the cretinoid state is that of abortive, or "*fruste*," myxœdema. WILLIAM OSLER.]

Differential Diagnosis. — Cretinism must be distinguished from achondroplasia: *i.e.*, foetal or congenital rickets, idiocy, and infantilism or dwarfism; also lipomatosis universalis, and hydræmic anæmia.

[Koplik (N. Y. Med. Jour., vol. lxvi, No. 10), following the lead of Horsley and Barlow, believes that "sporadic cretinism or infantile or congenital myxœdema should now also include those congenital cases formerly reported as congenital rickets." WILLIAM OSLER and RUPERT NORTON.]

ACHONDROPLASIA, CHONDRODYSTROPHIA FETALIS, or FŒTAL RICKETS, presents certain similarities to cretinism (Osler, Trans. Congress Amer. Phys. and Surgs., vol. iv, p. 190, '97). Although children suffering from this condition are dwarfs, yet they do not show any myxœdematous change of the skin; the long bones are very short, but the articulations are enormous, due to an hypertrophy of the cartilaginous ends of the bones. Mentally the patients are not degenerates.

RICKETS. — From ordinary rickets there can be little or no difficulty in distinguishing cretinism; in the former we find no thickening of the skin, which is moist, not dry as in infantile myxœdema. We also have the beading of the ribs, the enlarged epiphyses, and the prominent

bosses on the skull, none of which are seen in cretinism. But it is the condition of the skin and facial aspect which make cretinism absolutely characteristic.

IDIOCY. — Children suffering from idiocy, when not due to disturbance of the thyroid function, do not suffer, as a rule, from retardation of physical growth. Their heads are apt to be smaller, much smaller than those of cretins, except in cases of hydrocephaly, and the fontanelles and sutures have usually closed prematurely. Here, again, the lack of any alteration in the skin would be almost enough to distinguish the two diseases at first sight. But from the type known as the Mongol idiot the marks of distinction are not so readily recognized.

[The Mongol type of idiot resembles the cretin more closely than any other. Telford Smith, in speaking of this form, says: "Idiots belonging to the so-called Mongol type are those who most nearly resemble the cretin, both in physical aspect and in mental character. In idiots of this type we get the stunted growth, the dull, heavy expression, with open mouth and thick lips; the slow, deliberate movement, and hoarse, guttural, and monosyllabic speech; the mental apathy, and lack of spontaneity; the sluggish circulation, and sensitiveness to cold. A thickened condition of subcutaneous tissue is often found, with dull cutaneous sensibility. The skin is coarse and dry, the hair short and thin. First and second dentition are delayed. As far as palpation enables one to judge, the thyroid gland is subnormal in size. Pseudolipomata I have not found." He has tried the effect of thyroid extract with some benefit, but there is not the same remarkable change as in the cretins. I cannot altogether concur with Dr. Telford Smith's statement as to the slow, deliberate movements and mental apathy of Mongolian idiots. It was a form in which Dr. Kerlin, of Elwyn, was particularly interested, and with him I had many opportunities of seeing

cases. They rather impressed me as vivacious, often very sprightly and mischievous. In no instance was there any condition of the subcutaneous tissues suggestive of myxœdema. WILLIAM OSLER.]

To distinguish infantilism from cretinism is in many instances extremely difficult, and there is much confusion in the papers on this subject.

[Brissaud (Nouvelle Icon. de la Salpêtrière, Anno x, No. 4, pp. 240-262) believes that infantilism is nothing more nor less than myxœdematous idiocy, and that the differences in degree of infantilism result from two conditions diversely associated: (1) the intensity of the atrophic thyroid lesion; (2) the age at which the suppression of the thyroid function produced arrest of development. He says "many cases of infantilism should better be called cases of 'anangioplasia'; they have nothing to do with disturbances of the thyroid. Such are the cases first described by Lorain; they are not cases of arrest of development, but rather arrest of growth as a partial result of premature epiphyseal ossification; there is nothing infantile about them, except the figure; these are cases of small adults." Or, in other words, infantilism is a "morphological syndrome characterized by the preservation in the adult of the exterior form of infancy with the non-appearance of the secondary sexual characters" (Osler, Trans. Congress Amer. Phys. and Surgs., vol. iv, '97). There are many cases reported (Wunderlich, Brit. Med. Jour., ii, 1420, '97; Dukes, Brit. Med. Jour., i, 618, '98; and others) where the symptoms of cretinism or myxœdema are almost altogether lacking, and where the evidences of infantilism exist, but which improve markedly under thyroid treatment, thus showing that they should be classed as cases of cretinism, and not infantilism. It is such cases as these which have led to the confusion on the subject; but in future the differential diagnosis will be made readily if in no other way than by the effects of thyroid treatment; for undoubtedly a condition of infantilism does exist, non-dependent on the condi-

tion of the thyroid gland. WILLIAM OSLER.]

Lipomatosis universalis is a form of partial idiocy, with enormous fat accumulation; growth is not stunted, and the condition of the skin is quite different from that of cretinism.

In hydræmic anæmia there is a swelled condition of the eyelids, face, and lips; sometimes of the extremities; but rarely of other parts of the body. The temperature is normal; the bony system is perfect; there is no macroglossia, no alteration in hair or skin, no obliteration of bridge or nose; no mental defect. KOPLIK (N. Y. Med. Jour., vol. lxxi, No. 10).

Etiology.—All forms of cretinism depend on absence or atrophy of the thyroid gland, or upon some disturbances of its function. But we are as yet in ignorance as to those causes which produce atrophy, or as to what the exact functions of the gland are. Non-existence of the gland as a congenital affection has been demonstrated in a few cases of cretinism. Sporadic cretinism may occur, as far as we yet know, in any land; cases have been reported all over Europe and in this country.

Clinical summary of 60 cases observed in the United States by various authors:—

Sex: Males, 24; females, 36.

Age: Under two years, 6; from two to five years, 12; five to ten years, 12; ten to fifteen years, 10; fifteen to twenty years, 7; twenty to thirty, 3; thirty to forty, 4; over forty years, 4.

Nationality: American, white, 12; colored, 1; Polish, 2; French, 1; German, 5; Swede, 1; Hebrew, 1; Norwegian, 1; Irish, 7; English, 1; Swiss, 2; Bohemian, 1; nationality not given, 23.

Locality: There is no region in the country in which the disease is endemic, nor does it appear to be more prevalent in those districts, as in Michigan and parts of Ontario, where goitre is common.

Condition of the thyroid gland: Goitre was present in 7; gland stated to be normal in 12; gland small in 2; gland

not to be felt in 16; no note in 20.
William Osler (*Amer. Jour. Med. Sci.*,
Oct., '97).

The endemic form probably occurs only in mountainous regions, and usually in the valleys between the mountains; it is endemic in parts of Switzerland, Italy, France, India, South America, Central America, and Mexico. In the United States and Canada this form is unknown, and it is never seen in low-lying countries or on the sea-coast. Goitre is prevalent where endemic cretinism occurs, and the two affections bear a definite, though unknown, relation to each other. Baillarger says: "Endemic cretinism never exists without endemic goitre." In localities where goitre among human beings exists, it is also found to be prevalent among animals, especially among mules, but also among dogs and goats.

[The idea has long existed that the drinking-water in these mountainous regions was the cause of both goitre and endemic cretinism, and that they were due to either chemical or physical properties of the water, but Combe (*Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6) thinks that experiments have proved that the maladies cannot be attributed to either of these properties, but that the cause is a living micro-organism. He says that "goitre, and consequently cretinism, is an infectious disease, caused by a microbe, and that the microbe produces an hypertrophy of the thyroid, as others produce an hypertrophy of the spleen, kidneys, etc." He thinks that it is not always due to the drinking-water, but that the microbe may be "air-borne." Virchow also thinks air a possible means of infection. He and Rabuteau believe that goitre is the result of the feeble action of a noxious principle, and cretinism that of a strong and prolonged action.

Bouchardat and Bircher think that goitre is the first stage of cretinism. Air-infection might account for the epi-

demic which occurred in Somersetshire, England, in 1847; no cases are to be found there now. Combe gives an interesting account of an epidemic of goitre which occurred in Lausanne; and his study of these cases leads him to believe that not only is air an important factor in the causation of the disease, but that the affection is also contagious.

Mendel (*Deutsche med. Woch.*, p. 101, '95) suggests that the function of the thyroid is to secrete a substance which, when present, prevents the formation of or neutralizes, if formed, certain toxic substances. If the thyroid material be wanting, these hypothetical toxins accumulate and excite the symptoms already named.

Paterson (*Lancet*, ii, 849, '97) expresses his views in the following manner: "The first theory is that the gland secretes some substances which is essential to the healthy and harmonious working of the central and peripheral nervous systems. By the want of this substance the nervous mechanism is deprived of a something which regulates the formation and deposition of mucin products, so essential a feature of both diseases (sporadic cretinism and myxœdema), the mucin being thus deposited in the superficial and finer meshes of the corium, impairing motility and impeding nervous influences, afferent as well as efferent. The second theory is that the thyroid gland excretes from the blood some materials formed in the body-metabolism, which by their retention cause a form of toxæmia, affecting principally the cerebral centres and the nervous mechanism concerned in mucin metabolism." Combe (*Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6) sets forth a new view. He says: "Not alone the material antitoxins, but also the toxins, pass through the placenta. The child, as a result, would run a risk of being continually intoxicated, not only by its own toxins, but by those of its mother, if he did not possess a powerful antitoxic gland. What is the object of the thymus if not to accomplish this important task? The thymus is a powerful antitoxic gland, and a gland antitoxic for albuminoid toxins, like the thyroid,

since cases of myxœdema have been treated and cured with the thymus given in sandwich. Now, the cretin, whether he has a goitre or an atrophied thyroid, is born with a non-atrophic thymus. It is thus the active principle of the thymus which supplies the absent thyroid antitoxin, but as the thymus atrophies, as its active principle diminishes, poisoning manifests itself, and as a consequence cretinism develops. If the child is born a cretin it is probable that atrophy attacked the thymus as well as the thyroid: a fact which it is necessary to verify. This hypothesis is all the more probable, as Marie observed a case of congenital myxœdema in which the thymus was hypertrophied." From this he concludes that "the thyroid is an antitoxic gland whose function is to destroy, or modify, either by rendering innocuous or useful, some toxic substances resulting from the digestion of certain albuminoid bodies."

Moussu (Comptes-Rendus Hebdom. des Séances de la Soc. de Biologie, 2, S., vol. iv, No. 2, '97) and Brissaud (La Presse Méd., vol. i, No. 1, '98), on the other hand, do not believe that all the conditions seen in cretinism are due to the thyroid alone, but are also largely dependent on the parathyroid glands. Moussu draws deductions from experimental evidences which, he believes, prove that the two glands have two distinct functions—the suppression of the thyroid causing only chronic disturbances, that of the parathyroid provoking acute accidents; that death almost always follows extirpation of the latter, while disease alone is the result of extirpation of the thyroid. The parathyroids hypertrophy after removal of the thyroid. Brissaud from clinical evidence alone draws similar inference with regard to the difference of function of the two glands. He says "without doubt neither the structure nor the functions are the same, but it appears evident that very early in life they may replace each other (*"qu'elles se confondent à l'origine"*); and if, at a given moment, they are specialized so as to fill two absolutely-different rôles, and possibly antagonistic ones, the simplest may, in a measure,

take the place of the more complex and highly developed; in short, to take up both rôles, should it so happen. The human thyroid gland, if this is the case, would represent a perfected parathyroid with delicate epithelium (*"perfectionnée à épithélium fragile"*), but still preserving among its new elements the old parathyroid epithelium, more worn (*"fruste"*), more resistant, and more durable. . . . In any case, however, it seems to me incontestable that the thyroid myxœdema, to speak accurately, is that form which is not complicated by intellectual apathy, and that parathyroid myxœdema is that form which, resulting from a total alteration of the glandular structure, expresses itself not only by the characteristic infiltration, but by the arrest of development in the cretinoid idiot, or by the brutishness of cachexia strumipriva."

Magnus Levy (Verhandlungen des Congresses f. innere Med., Wiesbaden, '97) believes that cretinism in all its various forms depends on a perverted function of the thyroid, whether that be an increased or a lessened one. In four cases which he studied he found a diminution in the consumption of oxygen and formation of carbon dioxide, whereas in Graves's disease it has been more than once proved that there is a marked increase in the consumption of oxygen and the formation of carbon dioxide.

Bircher (Trans. Congress Amer. Phys. and Surgs., vol. iv, p. 203, '97) stands alone with his theory of the non-dependence of cretinism on the thyroid gland, but the accumulating evidence is so strongly opposed to such an idea that his proposition demands more confirmatory evidence than he has brought forward to substantiate it.

Such are a few of the theories which have been suggested to explain the conditions found in cretinism, but, except for the microbic theory of Combe, they do not explain the ultimate cause of the atrophy or degeneration of the gland. WILLIAM OSLER and RUPERT NORTON.]

In this disease as in all obscure ones we find numerous causes given as possible factors, but none of them seem to

play an important part; alcohol, syphilis, and tuberculosis have been considered in this relation, but no definite connection can be traced between them and cretinism. It has been suggested that cretinism may follow "alcoholic conceptions." Various nervous diseases in the families of both father and mother, or in the parents themselves, have been looked to as producing the cretinoid state, but no proof can be shown to confirm this theory. Cretinism may, however, follow as a very rare result some of the infectious fevers; for example, typhoid, scarlet fever, pneumonia, and whooping-cough; also an injury. Myxœdema in adults has followed erysipelas and acute rheumatism. Women who have once given birth to a cretin are likely to give birth to more if they become pregnant, but this may be prevented in some instances by placing the mother under thyroid treatment during her pregnancy. And, again, women who have lived in healthy countries and given birth to healthy children may give birth to cretins if they remove to a place where cretinism is endemic; but may, again, give birth to healthy children, if they return to a healthy locality.

[It has been suggested that as cretinism is more common in the female sex than in the male, that the thyroidal congestions caused by menstruation, pregnancy, and lactation may play a part in bringing about degenerative alterations of the gland. Cretinism does occur among the negroes of the United States, but is rare. "In cretins 25 per cent. have no thyroid gland, or it is replaced by connective tissue; in the remaining 75 per cent. the function is suppressed as a result of degeneracy of the gland, and in these cases, according to Kocher, there is oftenest a colloid goitre" (Combe, *Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6). Goitre is more common in females than in males, and cretinism, with or without

goitre, is more common in females. Griesinger has pointed out that, where cretinism is endemic, besides cretins, micretins, and the goitrous, one finds also a quantity of imbeciles, deaf-mutes, stutters, dwarfs, and degenerates. The French Commission came to the conclusion that goitrous parents engender cretins in a much large proportion comparatively than non-goitrous parents. WILLIAM OSLER and RUPERT NORTON.]

Sound and strong parents who have lived far from regions in which cretinism is endemic and had there begotten normal children, after moving into a district of cretinism have begotten one or more cretins. In some of these cases the parents, either father, mother, or both, became victims of goitre, but without a trace of cretinism. Moreover, after such parents have returned to their former place of residence, they again begot healthy children. In some cases normal children were begotten in the cretin districts by parents to whom cretins were also born.

The same influences which lead to goitre are a cause of cretinism. Whenever goitre or cretinism appears in children, one or the other of the parents will be found to have goitre. The discomforts caused by goitre, no matter how intense they may be, never lead directly to cretinism, not even in the slightest degree, but cretinism arises only and solely, when, by degeneration of the thyroid gland through goitre, or equally well by means of some other injury of the gland, its function is destroyed or seriously impaired. Inherited and, at the same time, congenital cretinism is derived from the mother alone; while inherited cretinism, which appears only after a lapse of months, or years, is derived from the father alone. Inherited and congenital cretinism is an exception.

The so-called inherited cretinism, as a rule, is congenital; that is, acquired during foetal life. The injury of the thyroid gland and the pathologico-anatomical substratum are the same as in cretinism, which develops later. But the injurious material is absorbed by the mother from without, and by her is transferred to the thyroid gland of the

fœtus. The overruling factor, then, is always the influence of the land upon which the mother lives. So long as the child is in embryo, its tissues, the provision and nourishment, as well as the disposal of waste-products, are cared for through the maternal blood. If, therefore, the thyroid gland of the child does not develop, or becomes atrophied through disease, the gland of the mother acts perfectly, both for herself and the child; so that the body of the child, at the moment of birth, will not show any more cretinic degeneration than that of the mother herself. If the latter have only a goitre in a thyroid gland in a normal portion of which the functions are still satisfactory, the child, at birth, will be plump and well shaped. It is only when the child, independently of the mother, begins to nourish its own nervous system and with it the thyroid gland, that, as in acquired cretinism, the disturbance begins gradually to appear. Kocher (Paris Correspondent Boston Med. and Surg. Jour., June 24, '97).

There is still one point to be considered with regard to the etiology of this disease, and that is the part played by "iodothyryn," or "thyro-iodine," as it was first known. In 1895 Baumann (Hoppe-Seyler, *Zeitschrift f. physiol. Chemie*, '95) demonstrated the existence of free iodine in the normal thyroid gland. It exists there in very minute amount, and there is less in the glands of children than in adults, and less in diseased glands (goitres) than in healthy ones. He later extracted the body "iodothyryn," which he believes to be the active principle of the gland; but it is doubtful whether this is the pure active principle; and, even were the cretinoid condition due to lack of formation of iodothyryn in the human body, we would still be in ignorance as to the primary cause of disease of the gland. Therapeutic use of iodothyryn has shown that both cases of myxedema and parenchymatous goitres do improve under its administration;

and that in sufficient doses it will prevent the development of the well-known symptoms, which occur in dogs, from which the thyroid gland has been experimentally removed.

Cretinism is relatively much more frequent in children than was formerly supposed. It passes oftentimes unrecognized. Koplik has pleaded most earnestly for its recognition. Heredity seems to be a factor in the adult form, but this has not been determined in the child. There is a growing opinion as to its infectious nature, but no very positive data have been obtained. The interdependence of nervous control over secretion is recognized as necessary to healthy functioning, but it is not certain whether disorder of such control is the cause. The process is a slow delay of the bony development of the body and a consequent dwarfism. (Englemann.)

The importance of combining the different glands in the treatment emphasized. Many of the unsatisfactory results of glandular treatment are because the case is treated in only one direction. After having seen that a single ductless gland has been given without results a combination with other glands should be made. As a rule, thyroid feeding will be sufficient for myxedematous conditions. Another point is a shortening of the cranium, producing, as a result, a synchondrosis of the bones. Many of these are due to rickets which runs its course before birth. When the child is born there is a shortening of the bones at the base of the cranium because of the ossification of the occipital and sphenoid. The cases that have a short base of the cranium will be improved the least. (A. Jacobi.)

It is in this class of cases that preventive medicine might achieve its most brilliant results. The term *athyria* employed by the author should be used to designate functional *athyria*, and not anatomical *athyria*. (David Riesman.)

The combination of the pituitary with the thyroid showed quite a difference in the growth of the patient. (Engle-

mann.) Proceedings Amer. Med. Assoc. (Med. News, June 21, 1902).

Pathology.—Whether all the pathological findings in sporadic and endemic cretinism are identical is a question still *sub judice*, but the later studies seem to show that there is no essential difference between them, and that the earlier-drawn distinctions are not sufficient to separate them. Virchow was the first to state that the brachycephalic skull was typical of the endemic cretin, and was due to a premature synthesis of the os basilare, and the sphenoid, posticus, and anticus. This produces flattening of the bones at the root of the nose, and gives the peculiar expression to the cretin. His deductions were drawn from a single case, and it has since been shown that the brachycephalic type of head is not characteristic, but that the skull may be flattened, round, or pointed (platy-, tropho-, or oxy- cephalic). It thus appears that no type of skull is typical of cretinism.

Another distinction has been made between endemic and sporadic cretinism, and that is that in the former the fontanelles close early, in the latter may remain open for a long time; but the significance of this difference is not yet appreciated or understood. The most interesting abnormal conditions seen in this disease pertain to the thyroid gland, the long bones, and the skin.

It appears that goitrous manifestations are far commoner in endemic than in sporadic cretinism, but goitre has been noted in several instances of the latter type of disease, and in all probability the presence or absence of goitre cannot be considered as a radical difference in the two affections.

Cretinism has a decided relation to goitre in this sense: that the same fac-

tors that produce goitre produce cretinism. Cretinism may be present, however, in persons who not only have no goitre, out in whom all traces of a thyroid gland are absent. It appears, then, that cretinism bears a close relation to the abolition of function of the thyroid gland. The causes of endemic cretinism must be the same as those of endemic goitre. It is probable that this is infectious in nature and dependent upon some factor contained in the drinking-water. Theodore Kocher (Deut. Zeit. f. Chir., B. 34, '92).

[Hofmeister (Fortschritte ruf dem Gebiete der Roentgen-strahlen, B. 1, H. 1, '97), studying a case of cretinism with the Roentgen rays, shows that the alterations in the long bones in this condition are identical with those alterations produced in animals where the thyroid has been removed; such changes have been noted by him in guinea-pigs, and by Eiselsberg's experimenting with sheep, goats, and pigs. They both found that, if the thyroid be removed early, the bones grow slowly in length, and the epiphyseal plates remain present for a long while. Hofmeister calls the resulting condition, after Kaufmann, "chronodystrophia thyreopriva." In this condition the epiphyses remain cartilaginous long beyond the normal term. The rays show that, although the bones are otherwise normal in form, they are very small, and what appears most evident is lack of bony ends. In all the long bones only the diaphysis is to be seen—the epiphysis is either not present or there are only a few small nuclei of bone to be made out. The patellæ, although they could be felt, were not seen with the rays. In concluding his paper he states that "between sporadic and endemic cretinism no absolute differences exist which in an individual case make a differential diagnosis possible."

Dolega (Vernandlungen des Congresses f. innere Med., Wiesbaden, '97) speaks of the autopsy of a cretin, aged 28 years, whose skeleton throughout showed the embryonal cartilaginous epiphysis and synchondrosis. Microscopical examination of the bones showed conditions

which resembled foetal rickets, but did not appear identical.

Langhans (Virchow's Archiv, B. 149, H. 1, '97) in an interesting paper, says: "Up to the present time no premature ossification of cartilage has been demonstrated in any cretin. The bones first represented by cartilage grow very slowly in length, and the epiphyses remain flat, ossification proceeds very slowly, the centres of ossification in the epiphysis appear very late, and the epiphysal plates remain a long time over the normal period. Remains of these even up to 45 years of age may still be demonstrated. . . . Periosteal growth is not markedly disturbed. . . . An abnormal thickness of the bones, such as Klebs describes, I have not been able to confirm." WILLIAM OSLER.]

In cretinism all autopsies agree in certain changes occurring in the histological development of bone quite distinct from changes occurring in rachitis, syphilis, or osteomalacia. In the long bones the typical and almost geometrical arrangement of the rows of cells, always found where hyaline cartilage is ossifying, becomes completely disordered. The rows of cells become irregular, the capsules swell up, and many of the cartilage-cells within shrink or disappear. The ground-substance itself may become liquefied in places, and all ossification which arises normally in such cartilage is checked, and growth in a longitudinal direction stops. The most marked change is at the junction of the epiphyses and shaft. In some of the autopsies fibrous connective tissue seems to appear around the epiphyses, forming soft, white deposits. Ossification of bone from membrane, and especially from the periosteum, is exaggerated, and the bones may become abnormally thick. William B. Noyes (N. Y. Med. Jour., Mar. 14, '96).

As a result of the above-mentioned facts it is now shown to be impossible to separate cretinism from operative cachexia thyreopriva, as Bircher has done. Therefore we may conclude from our present knowledge that they are

identical and that the former is, as Kocher first sharply and clearly stated, very probably caused by a lessened function of the thyroid during the foetal period as a result of toxic influences, either by becoming atrophic or entirely degenerating, or possibly by the formation of non-functioning struma-islets ("Strumaknoten") and the remaining portions of the gland being caused to disappear by pressure. . . . We should consider the development of the cretin in the following light: That cretins in foetal condition develop normally, that only after birth does the absence of the normal thyroid make itself felt, and that the first signs of cretinism appear at the fourth or fifth month after birth, and in the course of the next years of infancy make themselves more and more evident."

From the examination of three specimens of thyroid gland from adult cretins, nothing especially abnormal is found in gross appearances of texture. Microscopically is noticed a deficiency of gland-tissue and excess of connective tissue, and adventitia of the arteries thickened. In one of the less altered glands there were small foci filled with leucocytes. The most perfect alveoli are small and have only a single layer of epithelium; the others show less and less epithelium, some showing none and being filled with leucocytes or colloid masses, or cellular *débris*. There was never wanting some gland-tissue capable of performing its function. This lends strong support to the theory of the dependence of cretinism upon disordered function of the thyroid. A. Hanan (Brit. Med. and Surg. Jour., Oct. 4, '90).

As regards the alterations occurring in the skin, there is no such general agreement. The important question of the deposition of mucin is undetermined; the number of cases investigated thus far has been insufficient to settle this point, as the findings have differed.

[Virchow does not consider mucin as a constant and specific product of skin which has undergone myxedematous changes; and Unna found no mucin in two cases studied by him. A number of studies of the skin in myxedema have been reported, but as yet there are none on this tissue in cretinism. Since the two diseases seem to be now recognized as identical, we may accept the alterations found in myxedema as characteristic also of cretinism.

Barelay Ness (Glasgow Med. Jour., Aug., '97) describes the condition of the skin in myxedema, from the study of one case with autopsy, as follows: "The skin from the back of the hand was examined, and it was found that there was an abnormal proliferation of cells in the corium, especially along the courses of the capillary vessels. With regard to the sudoriparous glands, these were not atrophied, but their epithelium was much swelled, indicating a condition which might possibly have interfered with their function, and thus explained the dry condition of the skin."

Beck (Monat. f. prakt. Derm., B. 29, No. 12, June 15, '97), in reporting his findings in the skin in a case of myxedema, reviews all the work done on this subject, and his paper is the most exhaustive one that has as yet been published. He draws the following conclusions: "Regressive and progressive changes both play a part alongside each other. The regressive changes were noted in the epidermis and the different tissue-elements of the cutis; the latter were limited to the collagen and the smooth muscle-fibres of the cutis. In the epidermis the regressive changes present themselves as a 'sterile' condition, a necrosis and a degeneration of the protoplasm of the epithelial cells; in the cutis these changes are marked by a fibrillation of the collagen bundle and the formation of kollastin. The progressive changes consist of an increase in the collagenous tissue in the middle, and a multiplication of the smooth muscle-fibres in the middle and lower layers of the cutis. A special place must be reserved for the changes in the fat-tissue, which, as it appears, not only increases

in amount, but also undergoes a chemical change of the fat-globules."

Langhans (Virchow's Archiv, B. 149, H. 1, '97) found marked fatty degeneration of the muscles; it was generally distributed throughout the body, and the fat-globules were everywhere small. He says this condition is very rare and differs from that found, for instance, where it attacks the heart; then the distribution is not so general, and there is variation in the size of the fat-globules. He contends that in cretins this may result from the low temperature and imperfect oxidation; but toxic influences and the anæmic condition may also play a part.

In reporting a case of cretinism with autopsy Friend (Med. News, Dec. 4, '97) states that study of the pituitary body, thymus gland, suprarenal capsules, as well as of other tissues throughout the body, merely showed an excess of fibroid growth in all; and that the marrow was red in all the bones.

Ness (Glasgow Med. Jour., Aug., '97) in his case found extreme thickening of the capsule of the kidneys, with fibroid degeneration of the glomeruli; the latter appeared to have been primarily affected, and the capsule secondarily in places. (Although albuminuria and casts are found in the urine in a small number of cases, yet so far as we know there is no characteristic lesion of the kidneys in these cases, nor does the kidney seem in any manner to be seriously affected.) Red marrow in the bones (Friend) is unusual. "The marrow instead of being red is yellow (fat-marrow), which explains the anæmic condition of cretinoids. Only at the extreme ends of the bones near the cartilage is red marrow found" (Langhans). WILLIAM OSLER and RUPERT NORTON.]

There seems to be a general agreement among observers that the blood shows a condition of secondary anæmia; but there is considerable variation in the findings.

Blood studied in a case of congenital myxedema treated with thyroid. The diameter of the red corpuscles before the treatment began was 3.13 microns;

afterward it was 7.5 microns. At the same time the appearance of nucleated red corpuscles was observed, which disappeared under treatment. It would appear as though the persistence of the foetal state of the blood coincided with the tardy development of the body. Lebreton and Vaquez (*La France Méd. et Paris Méd.*, Jan. 18, '95).

[Koplik (*N. Y. Med. Jour.*, vol. lxvi, No. 10) says: "It is an interesting fact that in this case, early in the disease, the hæmoglobin was greater than later on, though the infant was immediately placed upon thyroids." This would seem to point to the fact that the anæmia of cretinism develops as the disease progresses, and is not present at the initial stage of the disease.

Vaquez (*Le Progrès Méd.*, Mar. 20, '97) found "merely a condition of anæmia, with presence of nucleated red cells; there appeared to be augmentation of the globular diameter" (first noted by Kroepelin); he did not find any leucocytosis, but there was an increase of the large mononuclears relatively to the number of polynuclears, after treatment with thyroid.

Pollaci (*La Riforma Med.*, vol. ix, Oct., '97), who has studied the blood in cretinism more carefully than any other observer, draws the following conclusions: 1. The blood of these two myxœdematous cretins presented the physio-histological characteristics of a common simple secondary anæmia; in different degree a single characteristic distinguished this oligæmic condition from similar conditions of oligæmia met with in other diseases—that was the presence of megalocytes. 2. Digestive leucocytosis had no special characteristics which distinguished it from alimentary leucocytosis studied in other diseases.

Foerster (*Deut. med. Woch.*, Nos. 12, 13, 16, '97) does not mention the presence of megalocytes, but says that "there is generally a slight diminution of the reds, with deficiency of hæmoglobin; as regards the whites they may or may not be increased, probably generally not. With reference to the different forms of white cells, there are not sufficient

studies to express any definite opinion, as the findings have varied." WILLIAM OSLER and RUPERT NORTON.]

On other pathological conditions existing in cretinism not enough is known to report definitely, but a few of them may be mentioned. Curvature of the spine occurs in some cases, though not in any large percentage. Some observers have noted hypertrophy of the pituitary body after thyroidectomy on animals; but nothing can be stated as to the meaning or importance of this fact. Excess of cement in the heart, which was first described by Ord, was not found by Ness (*Glasgow Med. Jour.*, Aug., '97) in his case.

[Langhans (*Virchow's Archiv*, B. 149, H. 1, '97) found exactly the same condition of the ovaries as Hofmeister did in his experiments with guinea-pigs: *i.e.*, a marked degeneration as shown by the presence of numerous small cysts. The testicles, according to this author, were neither macro- nor microscopically normal; they were small and contained but few spermatozoa. Maffeo, Niepce, and Stahl have described this same atrophic condition of the testicles. The "muscle-spindles" have been most exhaustively studied by Langhans (*Virchow's Archiv*, B. 149, H. 1, '97), but, as he says, they have been previously so little studied that the change he found in them in cretins cannot be definitely stated to be characteristic; yet the alterations in them from the normal were so marked that he believes they are one of the stigmata of this disease; the changes seem to consist of an exfoliation of the lamellæ of the spindle, with a deposition of mucinoid granules in the spindles, and an increase of connective tissue running through them. WILLIAM OSLER and RUPERT NORTON.]

Of other pathological conditions found in cretinism we know little or nothing.

At an autopsy on a 6-month-old child who had died suddenly, having shown during life some evidences of myxœdema,

the site of the thyroid gland was found occupied by some small, gland-like bodies, while at the root of the tongue there was a body which on microscopical examination was seen to be composed of epithelial space containing colloid material, and which had probably had a vicarious thyroid function. Aschoff (*Deut. med. Woch.*, p. 263, '99).

Thyroidin on infantilism and arrested growth. The normal hypertrophy of the thyroid gland at puberty antedates the development of the sexual organs. The thyroid secretion is increased in virtue of this hypertrophy, and the surplus is used for the growth of the genital apparatus, of which it is only a corollary. The initial cause of infantilism is dys-thyroid in nature, and complete myxœdema is the extreme degree of thyroid degeneration. Hertoghe (*Gaz. des Mal. Infant.*, vol. ii, No. 7, 1900).

Prognosis.—This has entirely changed since the introduction of the thyroid treatment; previous to this discovery little could be done to improve the cretinoid condition. To-day the outlook for cretins, more especially the sporadic cases, is bright; as regards the endemic cretins we cannot entertain such a hopeful view, though the chances of their improvement are much greater than they were. Cretinism is never of itself a fatal disease.

Treatment.—The use of the thyroid gland in one form or another has revolutionized the treatment of cretinism. Before this discovery we could do but little to improve the condition of patients suffering from this disease; pilocarpine seemed to be of some service through its action as a sudorific, and a mild winter climate also helped in slight degree to keep the patients from going down hill as fast as they otherwise might.

In the thyroid gland there seems to have been found a specific, and no other remedy appears necessary with which to treat the disease. The remedy, though a specific, is not all-powerful, since the

permanency of its action depends on its constant use. Even with its use we cannot promise a cure in any given case, for unless treatment be continued indefinitely a relapse will surely occur. The treatment seems to be of more avail in sporadic than in endemic cretinism; but this is not an established fact, and it seems probable that if treatment is begun as early as possible in cases of endemic cretinism we may hope for the same good results as are seen in children with sporadic cretinism. But to attain this mothers with goitre or those who have given birth to cretins or other degenerates should take the thyroid treatment during pregnancy. One satisfactory result of treatment is "that one thing appears to be proved by our observations, which corresponds to the findings of other observers, and which is not only theoretically interesting and practically important, but also consoling for the patient, and that is that under no conditions will the disease (which has been treated with thyroid, and then treatment stopped) develop again in its primary intensity." (Foerster, *Deut. med. Woch.*, Nos. 12, 13, and 16, '97.)

The later in life the condition of cretinism develops, the greater is the probability of almost perfect mental recovery under treatment, since mental degeneracy is never so prominent in adults as in children; the adult does not become an idiot as the child does from cretinism; whereas if the condition has developed early in life and been left untreated, the chance of normal mental development is seriously diminished. In both instances the return to a normal physical state is almost certain, as the body-symptoms react sooner to treatment, and they are the first to recur if treatment is interrupted.

The increase in height and the im-

provement in the condition of the skin under thyroid treatment are the two features which make the prognosis so favorable. Children show a most astonishing rapidity of growth during the first months or a year of treatment—a gain of eight inches in a year has been seen, and in a number of cases the increase was an inch or more a month for several consecutive months. After having thus attained a nearly normal stature, growth proceeds gradually, as in healthy children.

Case of a child who presented a typically cretinoid appearance when first seen in February, 1896, then 5 years old. Mentally deficient. Given one 5-grain tabloid of thyroid extract (Burroughs, Wellcome & Co.) daily, which raised the temperature to 102° F.; dose reduced to one-half. Gradual improvement. Weight fell at first to twenty pounds, and then slowly increased, the cretinoid aspect disappeared, and the intelligence steadily improved. Continued to take smaller quantities of the extract, and has developed into a healthy child, weighing thirty-seven pounds, and measuring thirty-seven and one-half inches in height. No thyroid gland could be detected on palpation. W. Carr (Brit. Med. Jour., Nov. 13, '97).

Probably cretins never develop physically so as to become the equals of normal children of their own age, but they are no longer dwarfs. This development of stature is the single permanent gain of treatment, since there is relapse of all the other features of cretinism if treatment is not persisted in. The change of the myxœdematous state of the skin is as remarkable as that of growth; the wrinkles disappear, also the œdema, and from being harsh, dry, and scaly, it becomes soft, moist, and smooth. The hair also shows great improvement, it grows normally where it had been lacking before, and becomes fine and thick, sup-

planting the coarse, thin hair characteristic of cretinism.

It is the brain, however, which, as the more delicate organ, suffers most in this condition; it responds more slowly than the body to the effects of treatment, and seldom if ever recovers a normal tone. Children who have suffered from cretinism are not so intelligent, as a rule, as other healthy children. As Koplik (N. Y. Med. Jour., vol. lxvi, No. 10) says: "Though the thyroid treatment rescues these unfortunates from a state of perpetual idiocy, it does not restore fully the psychical state, which has become dwarfed for a greater or less period before the therapy was initiated. Though bright, the children are not the equals of children of normal condition of their own age, but are very slow in appropriating ideas and in perfecting their speech-vocabulary." However, there are exceptions to this rule, and where the degree of cretinism is not marked, where the body seems to be more affected than the brain, children may be quite as intelligent and bright as those unaffected. There are a few cases reported where, though the physical symptoms were very much ameliorated, yet there was almost no improvement in the mental condition.

[Such cases have been reported by d'Andrea and Pieraccini. It is probable that in such instances there is a bad neurotic family history, or that the children themselves, before the onset of cretinism, have suffered from some neurosis (for example, convulsions, epilepsy, etc.). WILLIAM OSLER and RUPERT NORTON.]

Effect of thyroid treatment is: Increased metabolism, shown by (1) elevation of temperature; (2) increased appetite, with more complete absorption of nitrogenous foods; (3) loss of weight, with nitrogen excreted in excess of that taken in the food; (4) growth of skeleton in the very young; (5) marked improvements in body-nutrition generally;

(6) increased activity of mucous membranes, skin, and kidneys. The rheumatic symptoms and the anemia are not only not relieved, but are most frequently aggravated. G. N. Cray (St. Louis Med. and Surg. Jour., July, '95).

[Increase of anemia and aggravation of rheumatic symptoms observed in case of goitre complicated with rheumatism in which thyroid tablets were given. The tablets were discontinued and salicylates and iron substituted with good effect. C. S. WITHERSTINE, Assoc. Ed., Annual, '96.]

Without treatment cretins may live to an advanced old age, even to 70 or 80 years, though death is more common between the second and third decade or before 35. They are liable to very slight ailments, and usually die of some intercurrent affection, since cretinism seldom of itself causes death. We know of no difference as regards prognosis whether the child has a goitre, or shows atrophy or absence of the thyroid gland. In some cases even the goitre itself may be cured. Combe (*Revue Méd. de la Suisse Romande*, Anno xvii, Nos. 2 to 6) says: "Goitres may be cured by thyroid treatment; the younger the patient, the more efficacious is the treatment. Cystic goitres are not amenable, nor old colloid ones where there is much new growth of connective tissue, with a colloid degeneration of the vascular walls and interstitial tissue."

The remedy is a powerful one, and, where used carelessly, a dangerous one; patients have been killed by injudicious use of the thyroid gland.

[Anders (Jour. Amer. Med. Assoc., July 10, '97) says: "There can be no question that the evidences of cardiac disturbance constitute a really serious defect, and perhaps the only one in the thyroid treatment." He goes on to say, however, that "the relation of mere albuminuria or actual nephritis to myxœdema is not definitely known. On the other hand, it should be pointed out that

the symptoms of Bright's disease have been observed to appear after the accomplishment of a cure by thyroid feeding, in cases which no urinary phenomena had been present during the course of myxœdema." This is certainly a very rare occurrence and not one to be considered in the use of the drug.

Telford Smith (*Lancet*, vol. ii, 853, '97) has lately drawn attention to one of the disturbances resulting from this treatment which should be watched for: "I have found that during thyroid treatment this rapid growth of the skeleton leads to a softened condition of the bones, resulting in a yielding and bending of those which have to bear weight; and as cretins under treatment become much more active and inclined to run about this tendency has to be guarded against. The bending takes place most markedly in the tibia and fibula, the increased size of the ends of these bones at the ankle and knee being very noticeable." WILLIAM OSLER and RUPERT NORTON.]

The use of thyroid extract is only permissible when the patient can be kept constantly under observation, because of the severe and sometimes dangerous symptoms which it produces. Zarubin (*Archiv f. Dermat. u. Syph.*, B. 37, H. 3, '96).

Case of cretinism in a girl, 14 years of age, in which the thyroid-gland treatment was instituted and followed by a very slow improvement mentally and a much more marked one physically. After undergoing the treatment at irregular periods during about nineteen months, her temperature suddenly rose to 104° F., her pulse to 160, and respiration became so short and thick that it was only with difficulty they could be counted. At this time she was taking 6 grains of thyroid extract daily. Medication was immediately stopped, but her condition remained the same, with one remission of temperature and pulse-rate, during two days, when, on January 22d, at 1 o'clock in the afternoon, she died. S. H. Friend (*Med. News*, Dec. 4, '97).

Caution must be exerted in the use of thyroid medication, for, while it is all powerful for good in suitable cases, it is

not without ill effect in poorly-selected cases or in overdoses. It is best to begin with 5-grain doses daily and increase gradually to 15 grains daily in divided doses. A rise of temperature to one degree above normal, an increase of the pulse-rate of more than twenty beats per minute, or any gastro-intestinal disturbance indicates that the dose is too large and must be reduced. F. A. Dodge (Northwestern Lancet, Oct. 15, '98).

Case in which, at the age of 2 years and 8 months, the patient was in the condition of well-marked cretinism. The child seemed normal for the first four months of life, at the end of which it contracted whooping-cough lasting four months, and then it was seen to be abnormal. The origin of the cretinism attributed to the attack of pertussis. The effects of thyroid treatment upon the bodily and mental condition were remarkably rapid and complete. A few months later, however, death occurred in a malignant attack of measles. H. O. Nicholson (Archives of Pediatrics, June, 1900).

Many methods have been suggested and tried for administering the thyroid gland, but the best and only practical one is by the mouth. The gland may be used raw or cooked, or prepared with glycerin as an extract, or in powder, tablet, or pill form. The surest and safest form is the tablet as prepared by one or other of the large wholesale drug firms (Parke, Davis & Co.; Frazer, Armour, and others). These tablets are not all of equal strength; so that in treating a case it is better to use but one make than to change from one to another. The dose varies from $\frac{1}{2}$ grain once or twice a day in infants, up to 5 grains t. i. d. in adults, till all symptoms of cretinism have disappeared; the drug may then either be omitted entirely for from three to six weeks, when symptoms of cretinism almost always recur, and treatment must be resumed, or doses of 5 grains every week or ten days may be persistently

taken, and thus all evidences of returning cretinism be avoided. It is, perhaps, better after the first period of treatment has been successfully carried out to omit all treatment till some of the old symptoms again appear, and then to note carefully just how much thyroid is required to extinguish these; in this manner it is easier to estimate just the dose required from time to time to stave away any sign of the disease.

In some instances the tablets seem to lose their effect, and it is then well to try those of another make for a time; the first will, if resorted to again later, oftentimes be found to have the same good effects as when first tried, but the organism seems to get dulled to them, and not to respond so quickly after prolonged administration, just as is often seen in the use of digitalis in cardiac disease. The dosage must be regulated by the effects either advantageous or the reverse; where no bad symptoms are noted the drug may be pushed, but on the slightest evidence of any or some of the conditions to be immediately mentioned the drug should be stopped entirely for awhile, till all its bad constitutional effects have passed off.

The remedy may give rise to headache, syncope, and vertigo; to tachycardia, dyspnoea, suffusion of face and profound perspiration; to rise in temperature of two or more degrees (slight rise is a good sign, as the patient's temperature is almost invariably from one to two degrees subnormal); to nausea, vomiting, gastro-intestinal pains and profuse diarrhoea; to rheumatic pains, tremor, and general weakness; to itching, urticaria, erythema, and eczema; to glycosuria or albuminuria. Many of these effects are doubtless due to contaminations of the active principle of the drug, but at present these noxious bodies cannot be sep-

arated, and therefore extreme care must be taken in the use of the drug. Most of the bad symptoms will pass off when the drug is stopped, and require no further treatment, but if the prostration that may occur is severe, suitable remedies to counteract this condition should be actively employed.

[Marie (La Presse Méd., Oct. 9, '97) notes a curious symptom caused by thyroid treatment, namely: excessive thirst; the thirst was so great that the treatment had to be stopped; on the other hand, however, Briquet (La Presse Méd., Oct. 9, '97) relates a case where treatment cured the excessive thirst which had existed previously. But such a symptom is anomalous whether before or after treatment, and therefore of but slight significance. WILLIAM OSLER and RUPERT NORTON.]

(See also THYROID EXTRACT in ANIMAL EXTRACTS, volume i.)

The treatment, as far as we can now see, must be continued on and off through life.

WILLIAM OSLER,
Baltimore.

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INFANTS, DIARRHŒAL DISEASES

OF.—Gr., from $\delta\iota\alpha$, through, and $\rho\acute{\epsilon}\nu$, to flow.

Definition.—Diarrhœa in itself can be regarded as a symptom only: a symptom indicative of increased motor activity and of increased, and perhaps perverted, secretory activity in the intestinal canal.

Disturbance of the intestinal activity is sometimes due merely to the presence in the alimentary tract of irritating and noxious material and the increased secretion and peristalsis is to be regarded as an effort of nature to get rid of offending material; an effort which, if effective, and not unduly severe or prolonged, must be considered as entirely salutary in its character. More fre-

quently, diarrhœa, especially in infants, must be regarded as one symptom only of an intoxication of the system by toxins the product of pathogenic micro-organisms present in the alimentary canal: a symptom important in itself, but not to be considered apart from other symptoms of systemic intoxication,—such as fever, quickened and enfeebled cardiac action, and nervous prostration.

In many of these cases inflammatory changes more or less extensive in character are set up in the walls of the intestines; such changes may be due to some extent to the abnormal and irritating character of the intestinal contents, but, to a much greater degree, they result from the specific action of the bacterial toxins. In some instances the bacteria themselves appear to penetrate the tissues of the intestinal wall; destructive changes are thus induced which not only aggravate the general symptoms, but, should the case survive, indefinitely retard recovery.

Owing to the abnormal activity of peristalsis by which food is unduly hurried through the alimentary tract and to an alteration in the various digestive fluids, either quantitative or qualitative, the process of digestion is performed more or less imperfectly; owing, also, to inflammatory changes in the walls of the intestine, absorption is hindered and general nutrition becomes rapidly impaired. In some cases, where the diarrhœa is of a grave character, or persists throughout a long period of time, the emaciation becomes extreme.

Diarrhœa is thus of much importance as a clinical symptom; for this reason it has long been customary to group together under the name used generically all those disorders which have, as their prominent and most important symptom, an increased motor and secretory activity

of the intestinal tract from whatever cause arising. This use of the name lacks scientific precision; nevertheless, while our knowledge of many of the conditions met with in these disorders is still inexact and uncertain, it does not seem wise to attempt more precise definition.

Infants under the age of thirty months are peculiarly prone to diarrhœal disorders. In such infants disorders of the intestinal tract present an etiology and pathology peculiar to themselves, and in them, to a much greater extent than in older children or in adults, has the disease a tendency to run a severe course, and in a large proportion of cases to terminate fatally. For this reason the subject of infantile diarrhœa claims separate consideration.

Etiology.—If we inquire into the causes which induce this liability to diarrhœal disease on the part of infants, a few facts stand out prominently.

THE SEASON.—The diarrhœas of infancy take a comparatively unimportant rank among infantile diseases during the cooler months of the year, but with the onset of warm weather they suddenly acquire importance, owing to their general severity, to their large mortality, and to the frequency with which they are encountered. This is evidenced by the statistics of all large cities in the temperate zones. Whenever the minimum temperature of the atmosphere for the twenty-four hours reaches the neighborhood of 60° F., infantile diarrhœas assume the character of a wide-spread epidemic. An attempt has been recently made by some English physicians to connect the epidemic character of the disease with the temperature of the soil. Dr. Ballard, after careful investigation, states that the mortality from this class of disorders does not begin until the thermometer registers a temperature of 56°

F. four feet below the surface. That there is any relation of cause and effect between the two facts, however, has in no way been proved.

One of the contributory causes of epidemic diarrhœa, in London at least, is the scandalously inefficient scavenging of the streets. The attention of municipal authorities of all cities might profitably be directed with the view of instituting a systematic inquiry upon a scientific basis into the relation between the fouling of the air and soil and the prevalence of epidemic diarrhœa, especially in infancy. Editorial (*Brit. Med. Jour.*, July 28, 1900).

AGE.—An investigation of the age of children thus attacked reveals the fact that the great majority are under 2 years. Holt has given statistics of 3000 cases of diarrhœa treated in family and dispensary practice, classified according to age.

He finds that, of the total number, infants under 6 months form 14 per cent.; infants from 6 to 12 months, 29 per cent.; infants from 12 to 18 months, 24 per cent.; infants from 18 to 24 months, 17 per cent.; and children over 2 years, 16 per cent. In France, Lesage places the age of special liability as under 18 months and regards the first 3 months, and the period between the eighth and ninth months, when weaning is generally commenced, as specially dangerous.

The age at which diarrhœal diseases are most prevalent has been investigated by the writer. In 3000 cases occurring in New York City the ages are shown in the following table:—

	Cases.	Per-centage.
First six months.....	413	13.7
Second six months....	873	29.1
Third six months.....	722	24.1
Fourth six months....	514	17.2
Over two years.....	478	15.9
Under two years.....	2522	84.1
Between six and eighteen months....	1595	53.2
Crandall (<i>Archives of Ped.</i> , Nov., '90).		

Diarrhoea appears to be most frequent among children under one year of age. In England and Wales in 1894 the deaths of children from diarrhoea under five years old amounted to 9005. Of these, 7360 were infants under one year; 1332 occurred during the second year; while, in the third, fourth, and fifth years combined, there were only 313. Again, in London, 72 per cent. of all fatal diarrhoeas occur in the first year of life. Langford Symes (Dublin Jour. Med. Sci., May, '97).

A recent report of the Health Board of New York City shows that there was for one year 2789 deaths from diarrhoeal affections, and of these deaths 92 per cent. occurred in children less than 2 years of age. Gilbert (Amer. Pract. and News, Oct. 16, '97).

MODE OF FEEDING.—It is the experience of every physician who has kept a record of his cases that fatal, or even severe, cases of diarrhoea among infants fed entirely at the breast are extremely rare. Holt emphasizes this, when he says that, of 1943 fatal cases of which he has collected the records, only 3 per cent. were breast-fed exclusively. He refers to his statistics, infants under six months enjoy to the fact that the great majority of such are breast-fed, and in this way obtain a sterile and digestible food. With the commencement of artificial feeding, gastro-intestinal disorders at once acquire prominence. Too often the food substituted for breast-milk is more or less difficult of digestion, defective in composition, and liable to be supplied to the infant too frequently or in too large amounts, in this way setting up indigestion: the most important predisposing cause of infantile diarrhoea. But, as we all know, the materials supplied as food to the infant may be of the most faulty character, inducing indigestion, colic, and malnutrition in one or other of its various forms, and yet during the cool

season we meet with either no diarrhoea or diarrhoea of a temporary and easily controlled form.

Healthy infants have a normal tendency to loose, liquid, and semiliquid evacuations from the bowels: (1) partly from the condition of the intestinal tract; (2) partly from the nature of normal food: *i.e.*, breast-milk. Peristaltic movements in the healthy child are very active. Young blood- and lymphatic vessels are very permeable and the transformation of the surface-cells active and rapid. The peripheral nerves are very superficial, more so than in adults, whose mucous membrane and submucous tissue have undergone thickening by both normal development and morbid processes. Besides, the action of the sphincter ani is not very powerful. Faeces are not retained in the colon and rectum, and little time is afforded for the reabsorption of the liquid or dissolved faecal contents. Frequency of acids (sometimes normal) in the small intestine gives rise to formation of alkaline salts with purgative properties. Free acids when found in the intestine show that (1) the quantity of food is too large; (2) the quantity of digestive fluid is too small, causing fermentation instead of normal digestion. Louis Fischer (The Post-graduate, Sept., '92).

Of 58 deaths among children entirely raised by mothers' milk none had uncooked fruit given them. In 6 of these cases the mother herself had eaten uncooked fruit. In 2 instances 1 of the mothers had eaten boiled apples and the other cauliflower; so that there were 8 out of 58 cases in which fruit might be regarded as connected with the child's diarrhoea. Of 135 children under 3 years of age, not at the breast, whose deaths were inquired into, 2 ate fruit; the remaining 133 are distinctly stated not to have had any.

Of the 605 fatal cases of diarrhoea in Leeds in 1893, 66 per cent. occurred in houses either without drains or with drains not properly severed from the sewer, and one-fifth of the remainder (making 73 per cent.) had other sanitary defects. It is to the feeding-bottle and

to the infection of its contents rather than to fruit that attention must be most especially directed in the prevention of autumnal diarrhoea. J. S. Cameron (Lancet, June 30, '94).

Defective water-supply appears to affect the children over 5 years of age, but infants are swept away in hundreds by milk which is infected or contaminated. The greater number of fatal diarrhoeas are doubtless due to artificial feeding. All organisms grow and flourish in milk. Symes (Brit. Med. Jour., May 8, '97).

Infective diarrhoea sometimes rages as an epidemic. It practically never occurs in breast-fed children (at least in only 3 per cent.). Neglect or deficiency of ventilation seems to be a very important cause, and the bacteria in question appear to inhabit the superficial layers of the earth, becoming wide-spread when the temperature reaches 58° F. Langford Symes (Dublin Jour. Med. Science, June, '97).

Too frequent feeding is a common underlying cause of infantile indigestion, and the giving of too large a quantity of food in the bottle is another factor. In hot weather fermentation of the food, added to the depression of the infant's vitality resulting from the heat, gives rise to summer diarrhoea. Infants under two years are the greatest sufferers, but preventive treatment, if properly carried out, would do much to mitigate this veritable scourge. Cleanliness of the city streets and watchfulness of perishable food-products are important sanitary measures. If the dairy could be properly supervised and the milk delivered to the city consumer within twelve hours after milking, there would be very little summer diarrhoea. Another way that the city can help in this work is by providing parks and planting many shade-trees in the streets. H. D. Chapin (Med. Record, July 1, '99).

For the exciting cause, therefore, of the severe diarrhoeas of infancy we must seek further; such a cause, it is now almost universally conceded, exists in the growth in the intestinal tract of toxin-

producing bacteria. Such bacteria, probably, in the majority of cases are introduced with the food. During the colder seasons of the year these bacteria, while present more or less everywhere, remain quiescent, but, with the onset of warmer weather they multiply in any suitable medium with a rapidity almost incredible. No article of infant-diet appears to be so readily contaminated as cows' milk; not only is it liable to be infected from many sources, but at the same time it affords an excellent culture-medium for almost all forms of bacteria. Hence to it, more than to any other article of diet, are disastrous effects attributed. Moreover, it was formerly supposed that the acidity of the gastric juice, in the infant as in the adult, stood guard with a certain amount of germicidal power at the portal of the intestinal tract, where, even under normal conditions, there appears to be little hindrance to bacterial growth. Traube and Escherich, however, have shown that in young infants the stomach has but slight power of either digestion or absorption, and is rather a receptacle into which the milk is received for coagulation, and from which it quickly passes into the small intestine, where it meets the proteolytic ferment of the pancreas, relatively well developed even at an early age. Owing to this there is practically no hindrance to the development of bacteria in the alimentary tract of the infant, save the rapidity and completeness with which the digestive process is performed. Indigestion, therefore, by permitting fermental changes, furnishes the conditions under which any pathogenic bacteria, either just introduced by means of contaminated food or present in the canal but previously hindered in development, may flourish and evolve their poisonous toxins.

As additional predisposing causes, we may add that all conditions which lower the vitality of the infant tend to impair digestion, and, to this extent, favor the development of diarrhoea. Defective hygienic conditions, previous acute disease, and malnutrition in all its forms, especially rachitis, syphilis, and tuberculosis, appear to act in this way. Summer-heat directly prostrating the nervous system, overexcitement, and occasionally the nerve-irritation accompanying dentition, have all an influence more or less disturbing on digestion, and may, therefore, be regarded as predisposing causes of diarrhoea.

In a report of 54 cases of children, ranging from two and one-half months to four years, with digestive diseases, the gastric juice was examined 119 times, both qualitatively and quantitatively. Of the children, 6 had dyspepsia, 11 acute gastro-enteritis, 6 acute enteritis, 5 acute colitis, and 26 chronic gastro-intestinal disorders. Absorption occurs more rapidly under than over four years of age. Absorption is most affected in acute gastro-enteritis, next in dyspepsia. The stomach is least affected in acute dyspepsia and enteritis; most affected in acute gastro-enteritis and chronic diseases. T. von Hecker (*Jahrbuch f. Kinderh.*, Nov., 1902).

General Pathology.—The normal fæces of a healthy infant fed at the breast should be of a smooth and homogeneous nature, of semisolid consistence, of a dull-lemon color, and of a not unpleasant odor. They should have an acid reaction, due to the presence of fatty acids and of a small amount of lactic acid. Fat, chiefly in the form of neutral fats, fatty acids, and soaps, is almost always present, sometimes in considerable amount. Sugar is never present. Proteids, in breast-fed children, are present in small amount; but, in infants fed on cows' milk, casein is met with in considerable

quantity, rendering such motions firmer in consistence, paler in color, larger in amount, and with a distinctly more unpleasant odor. In breast-fed infants, under normal conditions, the bile-elements for the most part remain unaltered, but, as the diet becomes changed, the biliary pigments become decomposed, and, with the mixed diet of the second and third years of life, the fæces resemble those of the adult, excepting that they are less firm and more or less acid in reaction. Mucus is present to a considerable extent; also epithelial cells, chiefly of the columnar variety.

Under the influence of diarrhoeal conditions, the fæcal discharges become much altered. At the onset, and persisting so long as due attention is not given to the feeding, undigested food is always more or less present. Masses of casein are frequently seen, and may be easily recognized; fat may be present in small yellowish-white masses, somewhat resembling the former in appearance, but distinguished by solubility in ether. Unchanged starch may be recognized by the iodine test. The number of the discharges during the twenty-four hours may vary from four or five to twenty or more. Their odor is probably dependent upon the character of the fermentation present. When sour, an acid fermentation, and, when very offensive, albuminous decomposition is supposed to exist. The reaction is almost invariably acid; only when the discharges are more of an exudative than of a fæcal character does the reaction become distinctly alkaline. The color is very variable. The most noticeable change is to a varying shade of green, due, according to Wegscheider, to the conversion of bilirubin into biliverdin. Lesage, however, states that this green color is not always due to biliverdin, but is sometimes due to a chro-

mogenic microbe of which the pigment stains the stools; other observers, however, have not verified this statement. The amount of mucus is almost always increased, in some instances very largely so; when it is seen in quantity, it generally indicates a local congestion of the lower portion of the colon. Blood is occasionally seen, due sometimes to ulceration, but more frequently to local congestion and straining.

At birth, the intestinal tract of the infant is free from bacteria. This condition, however, is quickly changed, and even in otherwise healthy infants, many forms may be found in the faecal discharges a few days after birth. Under normal breast-feeding, however, and with good digestion, two varieties of bacilli are constantly found, and, for this reason, have been termed the constant, or obligatory, forms of healthy-milk faeces; they are the bacilli coli communes and the bacilli lactis aërogenes. The latter abound in great numbers in the upper part of the small intestine, where they appear to thrive in the yet-imperfectly-digested milk-curd. In the lower part of the small intestine and upper part of the colon they are met with in gradually diminishing numbers, while the bacilli coli communes, which in the small intestine are found only in comparatively small numbers, now multiply rapidly; so that in the lower part of the colon and in the faeces they greatly predominate over the preceding form and over other less constant varieties.

When breast-feeding is replaced by a more mixed diet, other forms of bacteria are found in variable numbers and in an inconstant way; among those frequently met with are the streptococcus coli gracilis, various forms of micrococci, various liquefying bacilli, and the bacillus subtilis.

In the discharges of diarrhoea some new forms make their appearance in great abundance, but, with the exception of the two before mentioned as always present, no one variety is so constantly met with as to permit it to be regarded as a specific cause. From several of these inconstant forms, however, Vaughan has isolated proteid substances, which when injected in very minute quantities under the skin of animals produce poisonous symptoms, such as vomiting and purging, with elevation of temperature, and in larger doses collapse and death. The question as to whether either of the obligatory forms under the abnormal conditions met with in diarrhoea develop pathogenic properties, though much discussed, can scarcely be said to be definitely settled. Of one, the bacillus coli communis, recent studies indicate that it may undoubtedly at times develop virulent pathogenic properties.

Booker, to whom the medical world is indebted for a careful investigation of this subject, states that in infantile diarrhoea the conditions for the development of bacteria in the intestinal canal appear to differ from those obtaining in the healthy intestine of milk-fed infants. The bacterial forms present a greater variety; forms met with only occasionally and in small numbers in the healthy intestine are now much more pronounced, and frequently appear in immense numbers; while the bacillus coli communis and the bacillus lactis aërogenes become more uniformly distributed through the intestine. No single species of micro-organism is met with sufficiently frequently to be regarded in itself as the specific exciter of diarrhoea; but among the many forms encountered several varieties of streptococci and the proteus vulgaris appear to be of special importance. The strepto-

cocci are met with frequently; occasionally seen in the stomach and upper part of the small intestine, they become much more abundant in the lower ileum and colon, especially in those cases where ulceration of the mucosa is going on. So constantly and in such large numbers are they found in these cases that it is reasonable to suppose that they play an active and important rôle in the ulcerative process. Of the *proteus vulgaris*, Booker says that it is found in more than half of the severer cases of diarrhoea; in the milder forms it is seldom met with. Cases in which this bacillus abounds present a different type of symptoms to those in which streptococci prevail; the patients more frequently show toxic phenomena and have watery or pasty stools with a putrid odor, but without evidence of serious inflammatory trouble in the intestine.

Among other forms of bacteria possessing pathogenic properties encountered we may mention the staphylococcus pyogenes, the bacillus pyocyaneus, the bacillus mesentericus, and the bacillus enteritidis (Gärtner). Such forms probably more or less modify the symptoms in special cases.

Although at birth the contents of the digestive tract are sterile, bacterial infection is brought about within the first twelve hours of life through the medium of the atmospheric air, which the infant swallows in large quantities. The various micro-organisms thus introduced into the system thrive and multiply in the mucus and undigested food which soon fill the intestine, and are constantly reinforced in numbers and diversified in species by the ingestion of contaminated milk or the swallowed secretions of the mouth. The danger which arises from these natural sources of infection is greatly increased by the fact that during infant-life the gastric juice is incapable of exerting any decided control over mi-

crobic growth, owing to its comparative deficiency in free hydrochloric acid. The entrance of undigested and fermenting material into the intestine induces violent peristalsis, with the result that the infant suffers from colic and diarrhoea until the bowel has succeeded in ridding itself of its irritating contents. If proper means are taken to assist Nature and to prevent a recurrence of the disorder, the stools soon resume their normal appearance and perfect recovery ensues. But if these evidences of digestive derangement are overlooked, gastro-intestinal catarrh supervenes. This inflammatory condition probably arises from direct irritation of the mucous membrane of the digestive tract by acid products of fermentation, and, since it is always accompanied by a diminution in the secretion of hydrochloric acid, gastric digestion becomes greatly enfeebled, and the various bacteria are afforded an unlimited scope of action. Within a short period of time the intestine becomes affected in a similar manner, and the child begins to lose flesh and strength and to present all the symptoms characteristic of chronic intestinal catarrh. The third and last stage of the disease is marked by a more or less extensive cirrhosis of the mucous membrane of the digestive tract, often associated with the follicular ulceration of the colon. The diarrhoea continues and the stools are largely mixed with mucus or streaked with blood; the marasmus increases, and death finally ensues either from exhaustion or from some nervous phenomena due to the absorption of toxins from the alimentary tract. W. Soltau Fenwick (Brit. Med. Jour., Dec. 21, '95).

[Fifteen varieties of bacteria have been isolated from the stools of children suffering from summer diarrhoea, in addition to the *B. coli* commune and *B. lactis aerogenes* of Escherich, and the forms are not yet exhausted. The great majority of the bacteria belonged to the group classed as saprophytic. No constant form was found, and no one form predominated in a large proportion of the cases. Baginsky, Corr. Ed., Annual, '91.]

Study of the stools clearly showing

that no single species of micro-organism is responsible for the disease, and also, in a general way, that the character of the passages and the nature of the systemic disturbance conform to the character of the intestinal infection.

In a considerable number of these cases the obligatory milk-fæces bacteria were found to be the chief bacterial ingredient of the stools. These were for the most part mild cases, of short duration, and usually without apparent toxic symptoms. The stools were sometimes very frequent, were usually acid in reaction, and lacked uniformity of consistence, having been often lumpy. They contained no leucocytes. Twenty-four cases of this type were studied. *Bacillus coli communis* and *bacillus lactus aërogenes* preponderated. Other bacteria when present appeared in very small numbers and were apparently insignificant. In all these cases *bacillus coli* preponderated in the stools over *bacillus lactis*.

In another set of cases, represented by six only of the ninety-two, while the obligatory milk-fæces bacteria, were greatly increased in number, the inconstant bacteria of the normal intestinal contents preponderated and appeared to play an important rôle in the induction of the symptoms. Thus, in three of the cases "bacillus a" was the most notable feature, and in one each "bacillus x," "bacillus y," and "bacillus d." These are the designations applied by the writer to four of the numerous inconstant milk-fæces bacteria of infants described by him in a former paper, several of which were found to be pathogenic to animals, and have since been shown by Vaughan to elaborate toxic substances when grown in broth. These cases were all severe and presented evident toxic symptoms. The stools were frequent in some, infrequent in others, and varied much in consistence. They often had a decidedly putrid odor. One of these cases in which "bacillus x" preponderated was fatal.

A third set of cases, comprising thirty-five, was characterized by enormous numbers of bacilli in the stools, among which *proteus vulgaris* was always found in large numbers. The ordinary obligatory milk-fæces bacteria were also constantly

present in very great excess of the normal, and in many of the cases a few streptococci and some other inconstant forms were also present. These were serious cases, usually chronic if not fatal, and characterized by emaciation and toxic symptoms. The stools were, as a rule, liquid, yellow or green in color, putrid, and neutral or alkaline in reaction. They seldom, however, contained mucus, leucocytes, or epithelium.

In the fourth and last set of cases, twenty-seven in number, micrococci preponderated in the stools, though in addition *bacillus coli* was present in increased number in all the cases, *bacillus lactis* in fourteen, and *proteus vulgaris* in four. The micrococci were for the most part streptococci. These cases were uniformly severe, and gave evidence of marked toxic disturbance. The stools were, as a rule, very frequent, often more than twenty in the twenty-four hours. They were soft or liquid, often greenish, and usually contained mucus and leucocytes in abundance. They were also at times very offensive. Though very numerous, the bacteria were not present in the stools in the enormous numbers met with in the third set of cases. Stained cover-glass preparations also showed them to be chiefly micrococci, not bacilli, as in the former cases. A general pyæmic infection was a not infrequent outcome of these cases. Booker (Johns Hopkins Hosp. Reports, vi, 159, '96).

Conclusions based upon a study of thirteen cases of infantile diarrhœa:—

1. The bacterium *coli* appears to be the pathogenic agent of the greater number of summer infantile diarrhœas.
2. This organism is the more often associated with the streptococcus pyogenes.
3. The virulence, more considerable than in the intestine of a healthy child, is almost always in direct relation to the condition of the child at the time the culture is taken and does not appear to be proportional to the ulterior gravity of the case.
4. The mobility of the bacterium *coli* is, in general, proportional to its virulence. The jumping movement, nevertheless, does not correspond to an exalted virulence in comparison with the cases

in which mobility was very considerable without presenting these jumping movements.

5. The virulence of the bacterium coli found in the blood and other organs is identical to that of the bacterium coli taken from the intestine of the same subject. C. G. Cumston (Inter. Med. Mag., Feb. and Mar., '98).

The gastro-intestinal diseases of nursing infants caused by bacteria divided as follows: (A) Ectogenous intoxications (through the ingestion of the poisons of fermented milk): (a) toxic catarrh of the stomach and small intestines; (b) cholera infantum. (B) Chymous infections (endogenous intoxication through abnormal fermentation of intestinal contents, producing, first, a secondary irritation and disease of the intestinal wall): (a) bacterial dyspepsia (acid diarrhoea); (b) dyspeptic catarrh (catarrh diarrhoea). (C) Intestinal infections (inflammatory irritation or invasion of the intestinal wall by pathogenic bacteria): (a) inflammatory catarrh (inflammatory diarrhoea); (b) inflammation, gastritis, gastro-enteritis, enteritis, enterocolitis, colitis.

Mixed infections are frequently met with, and play an important part in the complications and sequelæ. The facility of lactic fermentation and the slight resistance of the infant's stomach render infection particularly easy. The most frequent bacteria are the staphylococci, the streptococci, bacterium coli, streptothrix, and pyocyaneus bacillus. Theodor Escherich (Wiener klin. Woch., Sept. 20, 1900).

The anatomical lesions met with in the intestinal tract of the infant, as the result of the diarrhoea, are of a varied character and are due apparently to the intensity of the irritant and the period of time during which its action has persisted. Nevertheless, it must be acknowledged that there is frequently a surprising want of relation between the post-mortem evidence of disease and the severity of the clinical phenomena and *vice versa*: a lack of relation, which thus

far pathologists have not satisfactorily explained. Attempts have been made at a classification, but it is generally admitted that although cases may be grouped according to the prominence attained by certain lesions, no distinct dividing lines can be drawn.

In the more acute cases the lesions are comparatively superficial. In such, to the naked eye, the stomach and upper portion of the small intestine may appear almost normal; toward the lower end of the ileum and throughout the colon, indications of inflammatory disturbance are to be seen; as a rule, they are specially pronounced in the region of the sigmoid flexure. The most important of these indications are irregular patches of local congestion, and more or less swelling with hyperæmia of the solitary glands and of Peyer's glands. Under the microscope hardened sections of the intestinal wall show, in places, loss of superficial epithelium. This is especially noticeable toward the lower portion of the ileum and over the whole of the colon, where a considerable infiltration of the mucosa with polynuclear leucocytes may frequently be seen. In some instances an invasion of the mucosa by bacteria takes place in areas where the epithelium is absent (Booker). These local conditions are by no means to be taken as a measure of the general systemic disturbance, for in a proportion of cases the manifestations of an acute general infection are pronounced; evidenced in the liver by fatty degeneration and sometimes necroses of liver-cells, in the kidney by necrosis of the epithelium in the convoluted and irregular tubules, and in the lungs by a lobular pneumonia.

In cases running a longer course the inflammatory changes may be more pronounced. In a proportion of these the lesions may be described as catarrhal in

character. The macroscopic changes are to a great extent confined to the lower end of the ileum and to the colon, where the congestion is very pronounced, sometimes general, at other times localized in patches; the lymph-nodes are enlarged and can frequently be seen with commencing ulceration at their summit; Peyer's patches are also swelled and hyperæmic. Under the microscope hardened sections from stomach and small intestine reveal marked cloudiness of the epithelial cells and in places loss of superficial epithelium. The connective tissue of the villi and that supporting the glands of Lieberkühn is more or less densely infiltrated. The ducts contain an excess of goblet-cells and are distended with mucus. The loss of superficial epithelium is very general throughout the colon. Associated with it is a more or less dense infiltration of the mucosa, an infiltration which in places may extend even to the muscular coat. Should the case be more protracted, ulceration may supervene, chiefly in the colon, very rarely in the lower portion of the ileum. Such ulceration is, for the most part, superficial, rarely extending deeper than the mucosa. The ulcers, in general, are circular, but in the more severe cases several ulcers may coalesce, forming large, irregular patches, two to three inches in diameter (Holt).

In a larger group of cases the intensity of the inflammation appears to fall chiefly upon the lymph-nodes, which, throughout the colon and especially in the neighborhood of the sigmoid flexure, show indications of a destructive inflammation. Under the microscope they are seen to be swelled and infiltrated, many showing focal necroses. The surrounding tissues are deeply infiltrated with lymphoid cells. If life be longer pre-

served the follicular tissues break down, forming small, but deep, ulcers, with overhanging edges, exhibiting a tendency to extend chiefly in the submucous tissue. These cases have very generally a fatal issue. In those cases in which such a termination is avoided convalescence is very slow, the diarrhoea assuming a chronic form, maintained by the presence of these ulcers, which, with difficulty, take on a healing action.

In a few—fortunately very rare—cases the inflammation is of such an intense fibrinous character as to lead to the formation of false membrane. This is the most severe form, and, although the pyrexia may be relatively moderate, the constitutional symptoms are very grave; death generally takes place in from eight to twelve days.

The central nervous system examined in 7 cases of infants under three months old; fever was present in 5 cases, and in 2 death took place without any appearance of fever; in 3 cases the infants had been ill for some time; the rest, however, had short illness. Changes in the brain and spinal cord were found in all cases. Cells showing various degrees of degeneration were seen in close proximity to one another; the different stages in the morbid process could be accurately determined. The first abnormality was an irregular distribution of Nissl's corpuscles; this was dependent upon a process of disintegration affecting either the whole of the cell-body or else portions in the neighborhood of the nucleus or the periphery of the cell. Concurrently with this disintegration process the corpuscles either diminish in size or else enlarge; they become either paler or darker than normal, and they often lose their polygonal form. In more advanced cases the corpuscles disappear entirely, and their place is taken by a fibrillary net-work containing a clear substance in its meshes. In the cells showing marked changes the nuclei were darker than normal, and the nucleoli

were enlarged. Müller and Manicatis (Deut. med. Woch., Mar. 3, '99).

Study of the white corpuscles in 20 nurslings suffering from various digestive disturbances. The blood was examined at 4 o'clock in the afternoon, before the taking of food. The results of investigations are as follow: 1. In mild acute gastro-enteritis (1 case examined) the number of red cells is diminished; the total number of white cells normal. The leucocytic proportion is about normal, save that the eosinophiles are absent. 2. In acute grave gastro-enteritis (3 cases examined) the number of red cells is diminished; the total number of white cells is sometimes augmented and sometimes normal. The lymphocytes are always augmented; the mononuclears always diminished; the polynuclears and polymorphonuclears are sometimes augmented and sometimes normal. The eosinophiles are absent or normal. Nucleated red cells were observed twice. 3. In mild chronic gastro-enteritis (3 cases examined) the number of red cells is normal or a little diminished; the total number of white cells normal or increased. The number of mononuclears is always diminished; the lymphocytes, polynuclears, and polymorphonuclears normal or augmented. The eosinophiles were absent in 2 cases. There were no nucleated reds. 4. In grave chronic gastro-enteritis (11 cases) accompanied by a cachexia more or less profound, the number of red cells is almost always diminished. The total number of white cells is augmented or normal in one-half the cases, diminished in the other half. The number of mononuclears is always diminished, while the polymorphonuclears are always augmented. The lymphocytes and polynuclears are augmented or normal. The eosinophiles are absent in one-half of the cases; the nucleated reds were present in 3 cases. A striking feature of these results was the constant diminution of the large mononuclear leucocytes and the rarity of the eosinophiles. P. d'Orlandi (Phila. Med. Jour.; Revue-Mén. des Mal. de l'Enfance, July, '99).

Differential count of leucocytes in a series of twenty-five cases. In the blood of normal children under two years of

age it shows a relative increase in the small mononuclear elements and a decrease in the polymorphonuclears as compared with the adult. In the summer diarrhoeas there is usually an increase of the leucocytes, but the count varies within such wide limits that a high or a low leucocytosis cannot be regarded as of diagnostic value. On the other hand, the differential count is of more importance. A relative increase in the polynuclears is an indication of an intoxication with decomposition products in the intestine or of the toxins of pathological bacteria; the increase is, as a rule, in proportion to the severity of the infection. Knox and Warfield (Bull. Johns Hopkins Hosp., July, 1902).

Diarrhoeal Disorders.

Classification.—Attempts have been made at a classification of diarrhoeal disorders, based either upon the changes found post-mortem in the intestinal canal or upon the bacteriological conditions met with in the discharges, but in both respects our knowledge is still too imperfect to permit us from it to draw dividing lines in a thoroughly satisfactory manner. As physicians we are able also to recognize clinically certain types of the disease, which to some extent correspond with the groups that pathologists have attempted. Nevertheless we, too, must admit that our clinical types have no sharp dividing lines, but, both in the group and in the individual patient, show a tendency to pass from the milder into the more severe form.

Two recent classifications, which rest partly on a pathological and partly upon a clinical basis, are worthy of mention. One is that of Lesage, who, in a very interesting article recently issued from the French press, groups the acute cases of infantile diarrhoea into three classes.

In the first he includes all those which are due to the presence in the infant's food, whether breast-milk or cows' milk,

of irritant substances not the result of fermentation in the milk. These diarrhoeas are generally of a mild type and quickly controlled. In a second group are placed those cases where the disturbance is due to fermentation in the stomach or intestinal canal of indigestible but, at the same time, more or less sterile food. The constitutional intoxication in these cases is due to the abnormal development of bacteria previously existing in the canal (endogenous). These cases, although sometimes severe, generally run a comparatively mild course. The third and largest group contains all those cases in which the diarrhoea is due to fermental changes in the milk administered as food to the infant. The poison-producing bacteria are thus introduced from without (exogenous). The constitutional symptoms met with in this class are frequently of the severest type.

This classification, although interesting, is scarcely as satisfactory as that made by Booker, who also groups the acute cases of diarrhoea met with during summer into three classes. In the first he places all cases of a dyspeptic and non-inflammatory character. In these the stools are lumpy and acid and contain no leucocytes or epithelial cells; the bacteria are only those of normal healthy motions; and the diarrhoea is of a milder form and for the most part easily controlled; but, if neglected, it shows a tendency to take on the characters of one of the two succeeding classes. The second group is characterized by symptoms of only moderate inflammation, but there is present a well-marked toxic condition of the system; the stools are numerous, of a watery or pasty character, and contain few, if any, leucocytes, but bacilli in distinctly predominating numbers; seldom, however, is any one variety so greatly in excess as to exclude the influ-

ence of other forms. In the third group of cases we meet with a distinctly inflammatory diarrhoea associated with symptoms of a general infection; the stools are frequent and slimy and contain many leucocytes; streptococci are found in predominating numbers, although other forms of bacteria are also present. In the more severe cases an invasion of the tissues of the intestinal wall by the streptococci takes place, and in many instances more or less extensive ulceration of a suppurative character may be found post-mortem. There is, according to Booker, a considerable difference in the clinical course run by the individual cases in this group; some patients respond readily to treatment, while others are little influenced and steadily grow worse, until the disease terminates fatally. Booker thinks that this may possibly be due to the fact that the streptococci met with are of more than one variety.

Of this classification, Booker says that in typical instances the three forms may be easily recognized, but there are many transitional cases which do not fall into any one of the three groups and are probably due to a more mixed infection in which no one bacterium is especially predominant. This classification of Booker's corresponds clinically very closely with that of Holt, who, however, lays more emphasis on the anatomical post-mortem changes.

To these groups we must add a fourth, comprising those cases which assume a chronic type, and are not infrequently met with as the sequelæ of one of the preceding forms. With this group, as with the others, we can draw no definite dividing-line separating it sharply from the more acute cases. Holt terms those cases chronic which have persisted longer than six weeks. Some cases, however, assume the type of chronicity sooner,

even, than this. In them the signs of active inflammation subside, the appetite partially returns; the diarrhoea, though lessened, still persists and is associated in some instances with a varying amount of ulceration of the intestinal wall, in others with a more or less atrophic condition of the intestinal glands. In the latter variety the progressive emaciation indicates how serious is the interference with the processes of digestion and absorption.

These somewhat provisional groups may be tabulated as follows:—

1. Functional diarrhoeas, non-inflammatory in character.

2. Inflammatory diarrhoeas, in which the symptoms of a toxic systemic infection are predominant.

3. Inflammatory diarrhoeas, in which in addition to the systemic infection the symptoms of an acute local inflammation have a prominent part.

4. Chronic diarrhoeas, in which the acute inflammatory symptoms have more or less subsided, but in which the stools remain abnormal both in character and frequency, and emaciation is apt to supervene.

Functional Diarrhoeas.—Many cases of infantile diarrhoea are met with which cannot be otherwise regarded than as purely functional in character. During dentition a moderate increase in peristalsis and secretion is sometimes noted which it is difficult to attribute to any fault in diet, and which promptly subsides on the eruption of the teeth. In a few instances a similar condition may be induced by impulses acting through the nervous system, such as fright, over-excitement, and a sudden chill to the surface of the body. At other times these same causes appear to produce their effect chiefly by disturbing digestion. Substances also may occasionally be

given as food to the infant which act as direct mechanical irritants to the sensitive mucous membrane of the alimentary tract.

In this group are also to be placed many diarrhoeas met with in breast-fed infants, where, owing to a faulty dietary or mode of life, or to nervous overstrain on the part of the mother or nurse, the breast-milk becomes altered, resulting in either gastric or intestinal indigestion followed by diarrhoea. The time of weaning is similarly one of peculiar susceptibility. Infants artificially fed suffer sometimes from this form of the disease; in them any error in the preparation or administration of their food may be followed by an attack of diarrhoea. In such, however, these attacks are more liable than in the breast-fed to assume an inflammatory type. This liability is still further increased by all conditions lowering the digestive powers.

Symptoms.—In some instances the diarrhoea may commence quite suddenly with large more or less fluid motions, containing, besides faecal matter, considerable undigested material. In other cases symptoms of gastric irritation and abdominal pain precede for some hours the diarrhoea. Examination of the infant generally reveals a moderate amount of pyrexia: 100° to 102° F.; rarely does the temperature run higher except in cases of sudden onset with severe gastric disturbance. Slight abdominal distension may often be noted. The stools are frequent, thin, usually sour-smelling, and of varying color. In young infants on an exclusive milk diet, they are, in general, of some shade of green and of a distinctly acid reaction; occasionally, however, they are gray or chalky in color and frothy in character. In older infants, on a more mixed diet, the stools may have no uniform color, but be in part green and in

part some shade of brown, and of a very unpleasant odor. Examination under the microscope reveals, besides undigested material, only those forms of bacteria met with in normal fæces. The infant is peevish and may either refuse its food altogether or drink a part greedily to allay its feverish thirst, and then refuse the remainder. Should the pyrexia run high, nervous symptoms may manifest themselves in twitching of the limbs, prostration, and wakefulness.

The attack in this type of the disease is of brief duration. After the diarrhoea has continued for some hours the temperature generally falls; nervous symptoms, if present, pass away; the motions in a few days become less frequent and gradually resume their normal appearance; and the desire for food becomes more imperative.

Diagnosis.—At the onset, unless from the history of the case, it is impossible to predict with certainty just what we may have to deal with. It must be remembered that symptoms similar to the above may not infrequently usher in a severe constitutional disorder.

Colic is a symptom of many pathological states of the intestinal tract. The causes of infantile colic are: (1) flatulence; (2) influences acting through the mother; (3) indigestion; (4) refrigeration. The reasons for flatulence in the infant may be found either in the infant or in the mother. The absence of pancreatic digestion in early infancy is perhaps one reason for the frequency of imperfect digestion at this time of life. Slow or insufficient digestion results in the development of flatus. If the mother is constipated, the infant is apt to be constipated; and the mother's milk under these circumstances is apt to produce flatulence. The diet of the mother is also responsible for much flatulence in the infant. Another common cause is taking salts, senna, and similar purgatives by the mother, and

this, too, even when these drugs are not taken in sufficient quantity to produce any evacuation from the mother's bowel. Infantile colic sometimes arises from mental worry on the part of the mother or from suckling the infant immediately after sexual excitement. A case has been recorded in which a most obstinate colic in an infant immediately subsided when the mother had sought the aid of a dentist and had a carious tooth extracted which had caused her much toothache. The commonest cause is overfeeding, particularly too frequent nursing and feeding. Another common error is the giving of too large a quantity of food, even though the latter is of the proper composition and given at suitable intervals. In comparatively rare instances infantile colic arises from a deficient supply of food. Refrigeration is produced commonly by laying in a wet diaper, walking over a cold floor, or exposure of the abdomen to a draft of cold air. In cases of colic associated with grave pathological conditions one does not see the kicking of the legs observed in simple colic, nor does the child cry for a few minutes with pain and then relax into a smile. H. Illoway (Pediatrics, July 16, 1901).

Prognosis.—Simple functional diarrhoea, unless in infants of the weakest constitution, can never be regarded as presenting much cause for anxiety. The danger lies in neglect. An injudicious dietary, especially in hot weather, may prolong the attack or convert it into one of the inflammatory forms of the disease.

Treatment.—In cases where the diarrhoea appears to have removed the irritant it will suffice to secure absolute rest to the alimentary tract for a period varying from twelve to twenty-four hours, permitting only sterile water in small quantities as frequently as may be desired. If the attack has been of a mild character, a thin rice- or barley-water containing a small amount of sugar of milk may be allowed after the first twelve hours have passed. Stimulants in the

form of whisky or brandy are to be given only if any indications of prostration make their appearance. In the majority of cases this dietary may be increased after twenty-four hours. In infants who are breast-fed nursing may be allowed once every four or six hours, permitting the infant to take a little more than half its usual quantity at each nursing. Rice-water or weak albumin-water may be given between-times. In those artificially fed the food for several days must be weak in character, and limited in amount. A small quantity of a creamy milk may be added to the rice- or barley-water.

The foods of greatest value in the treatment of summer complaint, and the indications for their use, considered by the writer to be as follow:—

“Whisky, one of the most useful, never contra-indicated; especially useful in acute cases during the last twenty-four hours of treatment, but may be given at any time in either acute or chronic cases.

“Meat-broths contain so little albumin and carbohydrates that they are never theoretically contra-indicated. They may be given at any time, in either acute or chronic cases, but they are especially indicated in acute cases after the first twelve or twenty-four hours’ treatment.

“Cream contains so little albumin that theoretically it is never contra-indicated. It can do no harm in any form of the disease, but it will be found to serve the best purpose in chronic cases, and after the third or fourth day in acute cases.

“Barley-water and oatmeal-water may be mixed with milk to advantage, as they mechanically facilitate the digestion of casein. In this combination they may be useful in chronic cases and in convalescent acute cases.

“White of egg is contra-indicated in all cases of summer complaint when there are marked constitutional symptoms present, or when the diarrhoea is putrid or mucous, but it may be used in that form of the disease dependent on an abnormal acid fermentation.” Rachford (*Archives of Ped.*, No. 6, '92).

In an acute attack of summer diarrhoea in a child under two years of age all albuminous and starchy foods should be withheld at once. Instead, toast-water—made by laying in a large bowl two pieces of stale white bread toasted brown on both sides, pouring on boiling water till covered, and adding a pinch of salt and allowing to stand till cool, the clear water being then poured off into a fruit-jar and kept cool by ice—is excellent. Barley-water, made by boiling a handful of pearl barley in a pint of water for one hour or more, a pinch of salt being added, can also be prepared, and after it is cool the supernatant liquid can be poured off for use. From one to three tablespoonfuls of either of these foods can be given every hour or two for forty-eight hours if necessary. Alcoholic stimulants may be added if necessary. These drinks should always be given cold. When the vomiting and stools have improved, which usually occurs within forty-eight hours, nursing may be resumed at intervals of either two, three, or four hours. If sterilized milk be used it should not be for longer than the summer months, on account of the tendency to produce rachitis. A mixture of cows’ milk, diluted one-fourth with water and containing a little milk-sugar and a pinch of salt, is to be preferred. The prepared milk is placed into a double-boiler of agateware, and the water in the outer vessel is allowed to boil for fifteen minutes. The inner vessel is then rapidly cooled, and the contents poured into a well-scalded tight fruit-jar, and kept by the ice until required for use. The entire quantity required for use during the day can thus be prepared at once. After each feeding the child’s mouth should be wiped out with a bit of absorbent cotton soaked in a saturated solution of boric acid. Plenty of water that has been boiled and cooled should be given. Dessau (*Clin. Recorder*, '97).

In some cases of intractable diarrhoea suppression of milk from the dietary proves curative. Regurgitations and vomiting are frequent in such cases. The motions are foetid, liquid, or putty-like; much more frequent by day than by

night. The liver is swollen and sensitive to touch; there is progressive emaciation, the cachexia deepens, and the infant is in great danger. Milk does not suit all digestions. It is, above all, necessary that the secretion of pepsin should be normal, and even irreproachable milk should undergo all the necessary metamorphosis to cause it to be absorbed by the organism. R. Saint-Philippe (Indian Med. Record, July 19, '99).

Methods that have been found most successful in 682 cases of summer diarrhœa in dispensary and hospital service, as well as in private practice, with but 21 deaths. Most diarrhœas occur under two years of age. At this time the child's diet consists mainly of milk. As soon as the diarrhœa begins all milk must be stopped. This is true no matter what its source,—mother's milk, guaranteed cows' milk, dairy milk, or grocery milk,—all alike must be stopped completely and at once. It does no good to pasteurize or to boil or to modify the milk in any manner. It must simply be stopped. If the child be nursing there must be no food for twenty-four hours. Then nursing may be tried, but if it show any tendency to cause the diarrhœa to persist even breast-milk must be stopped and substitutes employed. If the child be on a mixed diet consisting mainly of milk, all the cows' milk must be stopped at once. It may be necessary to stop for days, even for weeks. The writer has seen a case in which only after five months could the use of milk be resumed. The substitute foods should consist mainly of carbohydrates. A tablespoonful of barley flour or of rice, cooked in a pint of water, should be given in quantities about equal to the amount of milk taken before; this for a child under one year of age. For older children more of the carbohydrates may be employed and the feeding mixture may be dextrinized. Such food is not pleasant, because of the sameness of its taste. To give a variety of savor, chicken-, mutton-, or beef- broth in small quantities may be added. Beef-juice may also be added at times, but sparingly and only with the idea of making the food tasty, not with

the idea of adding to its nutritional qualities. The free use of brandy and whisky, which is sometimes advised because children are in a weakened condition, is not advisable. They rather add to the lack of resistive vitality and do not increase the store of vital force, as is sometimes taught. The use of egg-albumin dissolved in water used to be a favorite recommendation. This compound is not, however, as suitable in cases of gastro-enteric disturbance as are carbohydrates. Bacteria can be cultivated on egg-water, while the fermentation set up by carbohydrates is rather unfavorable to the growth, especially of the pathogenic bacteria. The use of certain of the proteid-sparers has been suggested. The three classes of foods that come under this head are gelatin, fats, and carbohydrates. The fats are distasteful, and hence cannot be used for any length of time. The end-products of gelatin when digested are very similar to those of milk, and hence they would probably prove as unsuitable for the disturbed gastro-intestinal tract. Carbohydrates are therefore the indicated food-products. The by-products of carbohydrate digestion are mainly excreted through the lungs. This saves the intestines considerable irritation. C. G. Kerley (Proceedings New York Acad. of Med.; Med. News, June 7, 1902).

In the majority of instances, however, it is wiser to secure at the outset by means of medicine a thorough evacuation of the bowels, ridding them in this way of any fermenting material. To accomplish this we may make use of either castor-oil or calomel, both of which act promptly and with little irritant effect on the mucous membrane. Of the former a full dose may be given in any convenient way. Should there be much gastric irritation, as shown by a tendency to retch or vomit, the latter is preferable, and may be given in small doses— $\frac{1}{8}$ to $\frac{1}{4}$ grain, at short intervals—until a de-

cided effect is obtained. Afterward, if necessary, one of the preparations of bismuth may be given with each feeding, for a few days.

Slight purge should be given to begin with. If this fails, enemata of starch-water with from half a drop to a drop of laudanum may be administered, and repeated two or three times a day if necessary. Internally, bismuth or astringents are to be used. M. A. F. Plicque (Pract., Oct., '96).

In simple diarrhoea the indications are to first remove by purgatives the irritating and decomposing contents of the intestines. This is best done by giving calomel in small doses—say, $\frac{1}{10}$ grain—frequently repeated or by a full dose of castor-oil.

The second indication is to withhold food which would be likely to undergo fermentation and add to the existing toxæmia. Milk and other foods should be absolutely prohibited. The child should be allowed to take pure water quite freely. Barley-water, to which a little white of egg or sugar has been added, may be given, and, later, whey may also be given.

Third. If ptomaines are thought to be present in the lower bowel it would be well to irrigate after each movement of the bowels, using a warm normal salt solution (1 drachm to 1 quart), about 1 pint at a time.

Finally, such drugs as retard fermentation: *e.g.*, bismuth subnit., gr. x, every two or three hours; or soda benzoate in 4-grain doses in water every two hours. J. Lewis Smith (Pediatrics, July, '96).

Salicylate of bismuth given in fifty cases of diarrhoea in infants under two years of age, with only two deaths. The following formula is recommended:—

R Bismuthi salicylici, 24 grains.

Gummi arabici, 1 drachm.

Sacch. albi, $1\frac{1}{2}$ drachms.

Terendo adde aq. dest., 2 ounces.

Fiat lac, tum adde aq. dest., 4 ounces.

M. D. S.: The bottle to be kept in cold water or ice, and to be shaken well before use. One or two teaspoonfuls three to six times daily. In cases of

offensive diarrhoea the administration should be preceded by a dose of castor-oil. In acute cases the remedy is useless, but in all of a week's standing or longer its effects are excellent. Mikhnevitch (Med. Oboz.; Indian Lancet, Aug. 1, '97).

In a severe case of summer diarrhoea the first indication is to wash out the stomach, remove fermenting material, and prevent the absorption of toxic materials from the gastro-intestinal tract. This lavage need not be repeated. The intestines should be washed out frequently, however. It removes peccant material; it stimulates peristalsis, which also helps to remove undesirable irritating substances, and it supplies water to the infant: a very useful measure, since it is well known that the child is water-starved. A stiff rubber rectal tube, such as used for adults, may be used without fear. Too much pressure should not be employed, however, in forcing water into the intestine, as it is possible to burst them. The irrigator should not be placed more than one foot above the patient. It is a good plan to try to leave considerable water in the intestine when the irrigation is concluded. About a pint of normal salt solution should be employed. Koplik (Med. News, July 15, '99).

Of one hundred and seventy-one children suffering from diarrhoea or dysentery who were treated with tannalbin, only two died. Large doses give the best results. As much as 45 grains daily may be given without the slightest inconvenience. Waedemon (Annal. de la Soc. de Méd. de Gand, lxxvii, p. 277, '99).

Inflammatory Diarrhoeas.—The two groups of inflammatory diarrhoeas include almost all the cases of infantile diarrhoea met with during the summer months. They are very closely allied in their etiology, and although the intestinal lesions in the one are comparatively slight, while the symptoms of local inflammation in the other become prominent, in both we have to deal with marked constitutional disturbance. All that we have said in reference to the in-

fluence of age, of season, and of mode of feeding is equally true of both groups. The symptoms and course of these two varieties of the disease differ in important particulars. We have already referred to their pathology; we cannot but feel, however, that there is still much that is obscure, and later investigations may prove the bacteriological relations of the two classes are even closer than at the present they appear.

INFLAMMATORY DIARRHOEAS IN WHICH THE SYMPTOMS OF A TOXIC SYSTEMIC INFECTION ARE PREDOMINANT—ACUTE GASTRO-ENTERIC INFECTION—ACUTE GASTRO-INTESTINAL CATARRH.

Symptoms.—As we might be led to almost expect, when we consider the various ways and the varying numbers and characters in which these toxin-producing bacteria make their entrance into the alimentary tract and the varying conditions under which their development may take place in the stomach and intestines, the mode of onset of this disease is very variable. Frequently it is gradual; the symptoms may present little except their persistence to distinguish them from those produced by indigestion. The infant may be fretful, show occasional signs of colic, be restless at night, and slightly feverish; and associated with these disturbances may be some looseness of the bowels. As the disease progresses the symptoms increase in severity; the motions become frequent, thin in character, and of a varying color, and of a sour, or more generally of an offensive odor; pyrexia increases; the pulse becomes quick and weak; and pain becomes a marked feature, interfering with rest and sleep. At other times the onset is sudden, frequently with severe gastric disturbance, high fever, and sometimes alarming nervous symptoms.

In these cases vomiting is one of the earliest symptoms, and may continue in the most persistent manner; the temperature may be very high, 104° to 105° , but generally falls one or two degrees after diarrhoea sets in; twitching of the limbs, great restlessness, and sometimes delirium, or even convulsions, may usher in the attack. When the disease is well established, the symptoms become very characteristic; the infant is restless, crying frequently; the face is pale and its features somewhat pinched; the eyes sunken; the tongue coated in the centre, but with tip and edges red and dry; thirst is pronounced, but fluids are frequently vomited shortly after they are taken; the abdomen is generally, but not always, distended. Often we may distinguish through the thin abdominal wall special dilatation of the stomach or small or large bowel; the skin gradually assumes a dry harsh feeling, while the subcutaneous tissues waste rapidly; the temperature varies from 102° F. in the morning to 103° F. or more in the evening, and the quick and feeble pulse indicates great exhaustion.

While the stools may at first contain some undigested matter, this soon in great part ceases, and they become of a greenish, greenish-yellow, or brown color, and of an offensive odor, and are associated with a large amount of flatus. Little useful diagnostic information can be gained from their appearance, but we may generally consider that frequent and watery stools indicate a severe attack. The reaction is in the beginning always acid, but in the more severe cases becomes neutral or even alkaline. Lesage says that a relation generally exists between the character of the reaction and the degree of infection. Under the microscope the stools are seen to contain undigested food, epithelial cells, few if

any leucocytes, and numerous bacteria, among which bacilli predominate. Vomiting at the first may be violent and persistent, but, as the case progresses, the tendency for it is to subside. Pain to a greater or less extent is always present. In the earlier days it is a prominent feature; while later on, perhaps owing to general exhaustion, the infant appears to suffer less acutely. Exacerbations may be noticed shortly before each evacuation. The presence of abdominal tenderness is generally a difficult matter to ascertain.

With these local symptoms the indications of a toxic infection of the system are not wanting; the temperature remains moderately high, 101° to 103° F., with a tendency to rise in the evening and fall again toward morning; the pulse is quick, and may become weak and intermittent; emaciation goes on rapidly; with a greatly increased loss of fluid in the alvine evacuations, the urine becomes scanty and high-colored, and contains a large amount of indican. As the disease progresses to an unfavorable termination, the general prostration increases, the extremities become cold, slightly cyanosed, and sometimes cedematous, and the slightly-swelled eyelids only half-close over the deep-sunken eyes; the fontanelle, if still open, is much depressed; the infant ceases to cry, and death closes the scene generally in a very quiet manner.

Complications.—In the more severe cases complications are frequently met with. In a large proportion more or less bronchial catarrh is present by the end of the first week. Fenwick states that in 87 per cent. of his cases signs of bronchitis were present at the end of the fourth day, and lobular consolidation was encountered in nearly 37 per cent. of his entire number. The onset of bron-

cho-pneumonia is often very insidious; the cough may be only slight, but the respirations will be observed to be unduly frequent, and the temperature shows a distinct rise. The physical signs are generally obscure, and most frequently are localized at the base of the lungs.

Percussion may show only a slight deficiency in resonance, and on auscultation we may find either a diminution of vesicular murmur or the presence of sibilant râles. It is characteristic, however, of this form of infection that these signs are variable, and show a tendency to change from one place to another; it is exceptional to observe large areas of consolidation. The progress of the pulmonary lesion is modified by the general symptoms of the case; increased dyspnoea is always a symptom of grave import.

Pleurisy is very seldom observed; when it does manifest itself, it tends rapidly to become purulent. Associated sometimes with the pulmonary infection, but occasionally as a complication by itself, we meet with symptoms of cerebral congestion, manifested in stupor, delirium, or epileptiform convulsions. Only rarely do we observe definite signs of local trouble; such as strabismus, inequality of pupils, and irregular pulse and respiration. Lesage makes reference to some forms of paralysis which disappear with returning health. Thrombosis of the cerebral vessels may take place in the final stages, and may, or may not manifest its presence by special symptoms. Occasionally an attack of tetany may supervene. Should the drain of fluid from the tissues have been great, the defective circulation may in itself give rise to many of the above symptoms. Infrequently the cerebral symptoms may be regarded as of a uræmic nature.

A true parenchymatous nephritis due to infection would appear to be a rare complication. Kjellberg states he met with it in 47 per cent. of his fatal cases; but competent observers, both English and American, have failed to meet with it, except very occasionally. Fenwick states that albumin in the urine was noted in 17 per cent. of his cases before the fifth day of the disease; but in no instance did the urine show more than a trace of it. Under the microscope he never observed either blood-corpuscles or epithelial casts. Booker states that necrosis of the epithelium in the convoluted and irregular tubules was found in nearly all his cases, and, in not a few, hyaline tube-casts were demonstrable. Infiltration with leucocytes was not seen in any case.

Various rashes on the skin may occasionally be noted, usually of an erythematous nature; and, unless great care is exercised, a mycotic ulceration of the mouth and throat may add greatly to the infant's discomfort.

The normal leucocyte-count in infants under 10 months is 13,500; but there is considerable individual variation. Mononuclear cells predominate, the average number of polynuclear cells being 42 per cent. In dyspepsia, infantile atrophy, and gastro-enteritis there is no change in the proportion of the various kinds of leucocytes. In follicular enteritis and cholera infantum, with marked intestinal lesions, there is an absolute increase in the total leucocytes, and a small relative increase in polynuclear cells. The existence of lymphocytosis described in intestinal diseases in infancy denied. Japhar (*Jahr. f. Kinderh.*, B. 3, S. 179, 1901).

Diagnosis.—While there may be for the first two or three days some uncertainty in reference to the character of a diarrhoea, a persistent high temperature beyond this period stamps the attack as

of an inflammatory nature. After this date fluid evacuations of an offensive odor are characteristic of the toxic form; while small stools containing mucus in quantity and passed with much straining are met with in those cases in which the local inflammatory disorder is prominent. Typhoid fever is seldom met with during infancy; its onset is occasionally somewhat abrupt, but after the first few days its course becomes more characteristic. Widal's test should be applied in doubtful cases. Several of the acute specific fevers are sometimes ushered in by an intestinal disturbance, which may for two or three days be misleading; of these scarlet fever and pneumonia are probably the most important. Intussusception develops rapidly and the stools always contain mucus and a considerable amount of dark blood, and are passed with straining; for the first few days there is no pyrexia.

Prognosis.—In every attack of inflammatory diarrhoea the prognosis must be greatly dependent upon our securing from the outset fair hygienic conditions, and the strict observance of such dietetic rules as may be laid down. In no disease is the prognosis more affected by a faulty hygiene or by an imprudent dietary. In infants suffering from chronic dyspeptic troubles, or in those whose nutrition is seriously impaired, the prognosis must always be grave. During the heat of summer an attack of inflammatory diarrhoea is of much more serious import than one occurring during the cooler months of the year. In the course of an attack a decrease in the temperature and in the frequency of the stools are favorable symptoms, especially when associated with an improvement in the general appearance, an increase in the amount of urine, and perhaps an increased desire for food. On the other

hand, a higher temperature, more frequent and more watery movements, a more anxious expression on the features, increasing insensibility of the pupils, sighing and irregular respiration, a feeble and intermittent pulse, suppression of the urine, and the onset of nervous symptoms must all be regarded as of grave significance.

Treatment.—Regarding this disorder as due to an intoxication of the system, either induced suddenly by an absorption from the intestinal tract of toxins in large amount, or coming on gradually, owing to the development in the intestinal canal of pathogenic bacteria with a subsequent absorption of toxins, our first efforts should be directed to securing as promptly and as effectually as possible the clearing out of the intestinal tract. This we endeavor to effect by means of promptly acting purgatives, and by lavage of the stomach and large intestines; the small intestines, unless by means of purgatives, we are apparently unable to reach.

Infants with severe gastro-intestinal troubles improve to a remarkable extent when put on buttermilk. In 22 cases of acute gastro-enteritis, including 8 very severe ones, all the children recovered rapidly, as also 3 adults with mucomembranous enterocolitis and a large number of children with chronic gastro-intestinal troubles. The toxi-infectious symptoms vanished in the acute cases in less than twenty-four hours. Decherf (*Semaine Médicale*, Vol xxiv, No. 44, 1904).

At the same time we endeavor to limit the development of bacteria by stopping for several days absolutely all milk food, in which we know they are able to develop very rapidly; a sterile water only should be allowed as a drink for the first twenty-four hours. During the early days no astringent or drug which would tend to check peristalsis, at this period

to be regarded as salutary in character, is to be given. For the evacuation of the intestinal tract two drugs especially commend themselves, on account of their promptness and of the very slight amount of irritation which they induce. These are castor-oil and calomel.

Castor-oil is of much value if it can be retained in the stomach. A full dose, 1 or 2 drachms, may be given in any convenient way. In many cases there is too great irritability of the stomach for us to attempt the administration of this somewhat nauseous drug, and we can with advantage have recourse to calomel, which acts not only as a purgative, but also as an intestinal antiseptic. This drug may be given either in one full purgative dose, or in a series of small doses repeated at short intervals. Lesage recommends that if the onset is with high fever, a foul-smelling but not abundant diarrhœa, and a considerable amount of tympanites, a dose of about 1 grain, for an infant of three months, 2 grains for an infant under one year, and 3 grains for an infant over that age, should be administered, mixed with a little sugar in a powder. In those cases where the fever is only moderate, where the abdomen is soft and not distended, and the diarrhœa is copious, small doses of about $\frac{1}{5}$ grain may be given every one or two hours, for six or twelve doses. Other purgatives have been employed, but, in our opinion, they are not so satisfactory.

Should vomiting persist, a careful lavage of the stomach will often at this period of the disease prove of much value, not only removing fermenting material and toxins, but having a direct action on the gastric mucous membrane. This lavage can easily be accomplished by means of a few feet of rubber tubing, to which is attached at one end a soft-

rubber catheter, number 15 or 18 English (No. 30 Charrière), and to the other a small glass funnel. The fluid used may be either sterile water or normal saline solution, 7 per 1000. Its temperature should be about 100° F.

Three or 4 ounces should be introduced at a time and allowed to escape. This should be repeated until the water returns clear.

When the summer disease of infancy is established, no matter whether the infant is breast-fed or bottle-fed, milk must be stopped for at least twenty-four to forty-eight hours.

A thorough cleansing of the gastrointestinal canal from the mouth to the anus must be insisted upon.

One of the best medications is: 1 or 2 teaspoonfuls of castor-oil, followed in two or three hours by:—

R. Magnes. sulphat.,
Syr. rhei arom.,
Aqueæ fœniculi, of each, q. s. according to age.

M. D. S.

Teaspoonful every three hours until yellow stools are produced.

Large quantities of water should be given.

To cleanse the colon, an ordinary rectal soft-rubber tube (No. 6 to 10) is anointed with glycerin or vaselin and gently pressed into the rectum; the rectum is then thoroughly flushed with lukewarm (80° to 100° F.) decinormal salt-water solution. Several quarts should be used. The tube should be gradually pushed through the rectum into the colon.

Hypodermoclysis can be carried out in every household where a fountain-syringe exists. It is only necessary to adjust a long, sharp-pointed hypodermic needle (antitoxin needle) to the rubber tubing connected with the syringe. Nothing is so stimulating to an enfeebled heart, nothing will stimulate the circulation of the blood quicker than this method of salt-water infusion. Hypodermic injections of camphorated

oil, 10 to 15 minims per dose, repeated every two or three hours, if necessary, should not be forgotten. Louis Fischer (Inter. Med. Mag., July, 1901).

Occasionally one of the milder antiseptics is added to the solution; we are convinced, however, that using them in this way, either for lavage of the stomach or lavage of the intestines, the risk of absorption of an overdose more than counterbalances any possible advantage.

A few hours after the administration of the purgative, an effort should be made to wash out the colon. The infant at the first should be placed on its back with its hips well elevated, and a normal saline solution at a temperature of 98° F. be allowed to flow slowly into the intestines through a large-sized rubber catheter introduced for six or eight inches. The pressure in the tube should be slight, the reservoir not being higher than twelve inches above the hips of the patient. If the hips are sufficiently elevated a little gentle massage over the region of the sigmoid flexure secures the free passage of the fluid into the descending colon, and afterward, turning the infant on its right side, favors its entrance into the transverse and ascending colon. Should there be much pyrexia after the current has been once established, the temperature of the water may be lowered 10° or 15°. Lower than this has been recommended by some physicians, but the very interesting experiments of Dr. R. Coleman Kemp warn us that we may in this way produce too much depression. The injection should be continued until the water returns clear. If done carefully, the pulse after the injection should evidence more strength, the blood-pressure should be raised, not depressed. Afterward a cool or warm compress—70° to 100° F.—applied over the abdomen and covered with oiled silk and a flannel

binder soothes and assuages the pain. This lavage of the intestines may be repeated every six or twelve hours for the first two or three days; afterward less frequently.

Most desirable position for injection is the dorsal, with the thighs flexed and the pelvis elevated and a pressure of not more than one to one and one-half metres. In 200 patients experimented upon ileo-cæcal valve offered effectual resistance in only 27. Sokolow (*Amer. Jour. Med. Sci., Apr., '95*).

Intestinal lavage with warm, boiled water, Vichy water being added. Infant lying on the side, first the right, then the left; tube inserted 15 centimetres and water slowly introduced. If discharges fœtid, calomel; also 1 drop of laudanum every hour. If obstinate vomiting, lavage of stomach and egg-albumin in water given. Grancher (*Revue Gén. de Clin. et de Thér. Jour. des Prat., May 18, '95*).

In infectious diarrhœa in infants, the food-supply is to be stopped, the products of imperfect digestion removed from the intestinal tract by irrigation, continued until the water returns free from admixture of faecal matter. A solution of 20 grains of tannic acid in a pint or more of sterilized water injected and retained in the bowel about an hour. When vomiting persists the stomach should be washed out also. To neutralize the toxins calomel in $\frac{1}{10}$ -grain doses hourly for the first twenty-four hours is recommended. First among antipyretics is the cooled bath. When watery discharges continue after the irrigation, hypodermics of $\frac{1}{100}$ grain of morphine and $\frac{1}{800}$ grain of atropine can be given. Stimulants are indicated in the severe cases, and whisky is the best that can be given. After the urgent symptoms have subsided the child can be nourished with the white of an egg stirred in cold water or the mixture recommended by Jacobi: 5 ounces of barley-water, the white of 1 egg, 1 or 2 teaspoonfuls of brandy or whisky, some salt, and sugar. A teaspoonful every five or ten minutes is indicated. No milk should be given for several days. H. M. McClanahan (*Amer.*

Jour. Obstet. and Dis. Women and Children; Med. Record, Sept. 26, '96).

The successful management of the feverish stage in young children can be accomplished by hydrotherapy, by intestinal antiseptics, and by rest. The first step is to empty the stomach, if it has not already been accomplished, and then to give a slight enema. This, in young children from six months to two years, is accomplished by the use of glycerin and water. About 1 teaspoonful of glycerin may be used to a tablespoonful of warm water. After that high enema of 1 quart of tepid water and 1 tablespoonful of bicarbonate of soda is used. The child's buttocks are elevated at least to four inches higher than the shoulders; by means of a fountain-syringe holding two quarts and with the bag of the syringe one to two feet above the buttocks, the contents are slowly allowed to enter by gravity into the intestinal canal. W. C. Hollopeter (*Inter. Med. Mag., July, 1901*).

Many physicians at this period advocate strongly the administration of some drug which may act as an intestinal antiseptic. Among the more important of these drugs we may mention resorcin, menthol, thymol, bismuth salicylate, sodium salicylate, benzol-naphthol, and others.

It is not to be forgotten, however, that many of these drugs are very distinct cardiac depressants, and we are convinced that we have seen many instances in which they have been employed with too much freedom, to the disadvantage of the patient; at the same time it is questionable of how much practical value they are. Under this treatment the pyrexia will be found to slowly subside, and the frequency and character of the stools to alter for the better. At this stage some of the milder astringents may be of service. Among the most frequently employed are the salts of bismuth: the subnitrate, the salicylate, and the subgal-

late. These may be given in full doses, suspended in mucilage with some aromatic water. Tannigen, a new astringent, having also distinct antiseptic properties, may, after all the inflammatory symptoms have subsided, be of service. It may be given in a powder, combined with a little sugar, in doses of from 4 to 6 grains.

The disorder always commences in the stomach, and is most easily controlled by carbolic acid. But its hot taste and unpleasant smell, as well as the occasional occurrence of carboluria, rendered its use unpleasant. Resorcin is extremely palatable to children; and is devoid of toxic properties when given in doses from 1 to 5 grains. Three grains given every four hours to infants only a few weeks old without the least ill-effects.

In a hundred and twenty cases of intestinal dyspepsia in infants and young children this treatment was used with the following results: In 53 per cent. the disorder had lasted from one to two weeks, in 34 per cent. from two to four weeks, in 10 per cent. from four to eight weeks, and in the remaining 3 per cent. for a period of more than two months. Out of the entire number in only nine instances did the diarrhoea continue after the treatment had been pursued for a week, the majority ceasing within three days. W. Soltan Fenwick (Brit. Med. Jour., Dec. 21, '95).

In diarrhoea associated with very fetid motions the greatest benefit seen to follow the administration of creasote. W. H. Dickinson (Lancet, Mar. 28, '96).

Tannigen successfully employed in twenty-eight cases of diarrhoea. Sixteen of the patients had acute gastro-enteritis, and eleven chronic diarrhoea. In all of the acute cases but one the remedy acted promptly. In the cases of chronic diarrhoea, all of which were under one year of age, tannigen gave excellent results. Diarrhoea, of several months' duration, which had resisted other remedies, yielded with wonderful rapidity. Strauss (Berliner klin. Woch., No. 3, '96).

Certain forms of summer diarrhoea of

infants which are usually sudden in onset, and marked by some regurgitation of food; high temperature; copious brownish, then greenish, and finally often watery stools; and rapidly developing signs of collapse are amenable to prompt and vigorous treatment. The external temperature is low, while that in the rectum is high. The child moans, lies with upturned eyes, and occasionally gives a sharp cry such as that heard in meningitis. These are really cases of enterocolitis, the intensity of the symptoms depending on the degree of intoxication. The main indications are flushing of the colon and use of tepid baths, and will cause the temperature to fall and the symptoms to abate. Two or three douches may be required daily. Small doses of opium, not to check the diarrhoea, but to allay nervous symptoms, may be given in the early stages. The following formulæ are of value:—

R Bismuthi subgall., 29 to 36 grains.
Pulv. opii, $\frac{1}{2}$ grain.
Pepsini, 6 to 12 grains.

M. et div. in pulv. No. 12.

Sig.: One every four hours, alternating with the following:—

R Hydrarg. chloridi mitis, $\frac{1}{4}$ grain.
Ceri oxalat., 2 grains.
Sacch. alb., q. s.

M. et div. in pulv. No. 12.

Sig.: One every four hours. Stengel (N. C. Med. Jour., Apr. 20, '99).

The most common mistake made in private practice is to temporize during the first few hours with a case of summer diarrhoea, the child not appearing to be very ill. The rule should be to stop food at once and completely. The condition is primarily one of acute intoxication; hence the stomach and intestine should be evacuated as soon as possible. Irrigation of the bowel in bad cases four or five times daily is of great value. The water should be at first at a temperature of 100° F. or a little higher. Before finishing the irrigation it may be well to allow the temperature to sink as low as 75° F. Instead of giving these children food they should be given small quantities of sterile, tepid water at short in-

tervals. Sterilized milk must be excluded in these cases. L. Emmett Holt (Med. Record, July 1, '99).

Brewers' yeast successfully used in gastro-enteritis in children. An aperient is first administered. The intestine is then washed out, and a teaspoonful of dried yeast, or a dessertspoonful of fresh yeast, dissolved in 2 fluidounces of boiled water at about 98° F., is then introduced by a rectal tube. The tube is withdrawn, and the child is kept still so as to retain the injection as long as possible. This process is repeated thrice daily, the aperient, of course, excepted. Thiercelin and Chevrey (Gaz. des Hôp., Jan. 9, 1900).

Seventy-one cases of infantile diarrhoea treated by salol or petroleum. The ages of the children varied from two months to two years, almost half of them being under one year. Only 8 of the children were fed entirely on the breast, and of these none died. Of the 63 bottle-fed infants 3 died. Salol given in powder, from $\frac{1}{2}$ grain every three hours to 3 grains every four hours, and petroleum in a 30-per-cent. emulsion. The usual doses for a child one year old were 2 grains of salol every six hours, and of petroleum 1 drachm of the emulsion thrice daily. W. E. Fothergill and J. Penny (Med. Chronicle, Apr., 1900).

The glairy dysenteriform enterocolitis is favorably modified by fresh guarana powder, which should be used after cold maceration and be prepared some time in advance. The dose varies with the patient's age: from $7\frac{1}{2}$ to 30 grains in the twenty-four hours. R. Saint-Philippe (Le Bull. Méd., June 6, 1900).

The infection of the gastro-enteric contents not dreaded so much as the malnutrition following. Very frequently after successfully ridding the infected alimentary tract of the offending micro-organisms the infant fails to thrive. Or a severe form of cholera infantum is carried through the storm. The baby seems much better, but yet no food can be had to agree. Fever may develop, and the patient succumbs to septicæmia. In these conditions human milk, even in small doses, has a powerful therapeutic effect. It stimulates the diseased epithelial cells so that they again

imbibe nourishment; it strengthens the body to resist the onslaught of infection.

Given a case of acute gastro-enteric infection of great severity, the ordinary measures must be instituted. The alimentary tract should be thoroughly evacuated, and water administered in large quantities. For two or three days rice-water or barley-water may be safely given; but then the question of additional food arises. The answer is: add a little human milk to the rice-water. Gradually increase the amount of human milk, carefully noting its effect, and if symptoms improve sterile cows' milk may be gradually substituted for the human milk. If egg-water is used during the diarrhoea the human milk can be added to this. John Zahorsky (Pediatrics, Mar. 15, 1901).

No better basis for an artificial food for children in the first year of life exists, and, further, in cases of gastrointestinal disorders in infants, with the passage of fluid, partially digested stools, the administration of a buttermilk diet is attended in most cases with excellent results. Frequently within two or three days the diarrhoea ceases; firm, normal stools are passed, and the child begins to increase in weight. It is important that the buttermilk should be derived from the cream of perfectly fresh whole milk. A food prepared by adding 1 ounce of wheaten flour and $1\frac{1}{2}$ ounces of cane-sugar to every 2 pints of buttermilk, the whole being boiled, with stirring, for two minutes recommended. Quantities varying from $\frac{1}{2}$ to 2 pints were given daily, and although the children did not like it at first they soon took it well. In a few cases it was found unsuitable and a more fatty diet resorted to. The infant mortality in the Kaiser und Kaiserin Friedrich Hospital in Berlin has fallen since the use of this food. The good results are due chiefly to the presence of the casein in a finely divided form, and the writer does not think the diminished fat-content of great importance, though most writers consider this factor also of value to feeble digestions. Caro (Archiv f. Kinderh., Sept., 1902).

Chronic Diarrhœa.

Etiology.—The chronic form of diarrhœa is met with either as the result of a previous acute attack or arising in an insidious manner from prolonged irritation of the intestinal canal by ill-digested and more or less fermenting food.

In the majority of those cases in which it follows an acute attack we have to deal with more or less definite organic lesions present in the alimentary tract. In some the persistent diarrhœa is due to ulceration of the intestinal wall, generally follicular, but occasionally catarrhal, in character. In others a more or less atrophic condition of the tubular glands and villi in the small intestines, associated with marked cell-proliferation in the adenoid tissue of the mucosa (Holt), is present. In a few instances the constitution of the infant has been so profoundly impaired during the acute attack that the various systemic functions are re-established with difficulty. Digestion continues to be imperfectly performed; and fermentation with development of toxins takes place to an irregular extent. This slight, but continued, systemic intoxication manifests itself in anæmia, defective general nutrition, and an irritable nervous system.

Symptoms.—The cases of chronic diarrhœa form a considerable proportion of the diarrhœas met with during the autumn. In such, the symptoms of acute inflammation have to a great extent subsided; the temperature remains for the greater portion of the day normal, and sometimes falls even below the normal line; and pain and tenderness have almost entirely passed away; but the motions still remain too frequent; their odor is offensive; blood is occasionally seen in the form of minute dark specks; and mucus of a greenish or brownish color is still present in considerable amount. The

consistence and color of the stools is variable. At one time they are of nearly normal consistence and fairly homogeneous; at other times they are quite fluid. They are usually associated with much flatulence. Prolapse of the bowel occurs only occasionally.

The infant's appetite appears very variable, but a fair amount of nourishment is generally taken during the twenty-four hours. Vomiting is infrequent. Nevertheless the infant remains pale and weak, and lies in a helpless and apathetic manner. As the disease progresses nutrition steadily fails. The infant ceases to grow. A gradual loss in weight occurs through wasting of the subcutaneous tissues till the inelastic skin hangs in folds over the shrunken limbs. In many cases the abdomen may be somewhat distended, but in others it is soft and retracted. The liver and spleen are found of normal size. The mesenteric glands, although in post-mortem examinations they are seen to be enlarged, are not palpable. Occasionally petechial spots are seen either on the abdominal wall or on the extremities. The circulation in these infants is very feeble. The extremities are always cold, sometimes cyanotic, and occasionally œdematous. The urine is scanty. The nervous system suffers with the general failure in nutrition. The infant is peevish, easily disturbed, and sleeps badly at night.

The progress of these cases is by no means uniform. Some weeks may show a slight gain; but trivial causes, a chill to the surface of the body, or a slight irregularity in feeding, may bring on a relapse, and the gain is usually soon lost.

Complications frequently arise. Bronchitic or pneumonic symptoms may appear in the lungs. Rachitis frequently develops. Sometimes we have a general adenitis, or a still more distressing furun-

culosis. Only very rarely is nephritis encountered.

A fatal termination is frequently hastened by some intercurrent disease; at other times it advances very slowly and the ending comes so gently that the exact moment of death is unascertainable. In a few cases, however, the appetite gradually returns, the stools become more normal, nutrition gradually improves, and at last convalescence is thoroughly established.

In the second class of cases this chronic form of diarrhoea establishes itself without any preceding acute attack. Eustace Smith considers that in the majority of these cases the affection is due to repeated chillings of the surface of the body, producing a catarrhal condition of the gastro-intestinal tract. Another important factor is undoubtedly a more or less faulty dietary, associated with the depressing influence of unhygienic surroundings. It is a form of diarrhoea frequently met with in young infants under four months reared in hospitals or foundling institutions.

The onset of the attack is gradual and insidious. A failure to gain in weight, or an actual loss, may be the first symptom demanding attention. On inquiry the infant will be found to pass several pale, pasty evacuations during the day, which on examination will be found to consist in great measure of undigested food. In spite of ordinary therapeutic measures this condition is apt to persist. Some weeks a slight improvement may be noted, but occasional exacerbations of the diarrhoea with fever soon dissipate any gain that may have been made. As the disease progresses, the stools change in character and become more frequent; at times they may be frothy and sour-smelling; at other times thin, dark-colored and offensive; their character is very

variable. The abdomen is generally more or less distended. Cool perspirations occur when the infant falls asleep. The urine becomes scanty and contains both indican and urobilin. Nutrition fails. The skin assumes an earthy hue, and the face acquires a curious look of old age. The infant lies in its cot in a helpless, apathetic state, and makes its wants known by a scarcely audible whine. Such infants readily succumb to some intercurrent disease. Any of the complications which we have already referred to in connection with the preceding groups may be met with in this condition; the mortality is very great. Medicines appear of no avail. A complete change of air, to the sea-side or a bracing country- or mountain- air, appears to be the only remedial measure to any extent effectual.

Diagnosis.—An exact diagnosis in these cases is often difficult. The question arises as to whether the condition present in the intestine is a sufficient explanation in itself of the serious failure in general nutrition, or whether we have in addition to deal with some underlying constitutional disease,—such as tuberculosis, a disease which not infrequently manifests itself as a sequel after severe or prolonged diarrhoeal attacks. The question will always be a difficult one, but the physician will act wisely if he base his opinion rather upon the history of the case and the general condition of the patient than upon any one particular symptom or physical sign.

Prognosis.—The prognosis in cases of chronic diarrhoea must always be very guarded. To some extent it is dependent on the previous constitution of the infant, on the hygienic conditions obtainable, and upon the zeal and regularity with which all instructions are carried out. To a great extent it is also dependent upon the severity and extent of the

intestinal lesions. When ulceration, either catarrhal or follicular, is present to any considerable degree, the prognosis is always bad, though perhaps, under favorable conditions, not hopeless. In those cases, on the other hand, where mere catarrhal or follicular inflammation without ulceration is present the prognosis is distinctly better. With favoring circumstances we may hope that a large proportion of these will proceed to complete recovery. To distinguish accurately between these two classes by the symptoms or physical signs existing at the time of examination is impossible. Our chief dependence must be placed on the previous history of the case. The longer the inflammation has lasted, and the higher has been the temperature, the greater the probability of ulcerative lesions. (Holt.)

Treatment.—With the conditions present in chronic diarrhoea no good, but often harm, may result from the employment of ordinary astringent, or even antiseptic, remedies administered by the mouth. If drugs are to be given, only those should be employed which will not disturb the stomach, and may to some extent improve general nutrition. Given with this object in view, some cases among older infants do undoubtedly derive benefit from the prolonged administration of iron. It may be given either in one of its acid preparations, or in a neutral and less irritating salt. Nutrition may also in some instances be assisted by the inunction over the abdomen or body generally, of codliver-oil, or cocoa-butter. The moderate employment of stimulants is called for in almost all cases. Great attention must be given to the dietary and to its proper regulation; and to this end the stools should be frequently examined. Fats are only to be allowed with much caution. Starchy

foods should be more or less predigested. Considerable benefit may be derived from the employment of scraped meat, meat-juice, broths, and peptonized meat-foods. For younger infants milk-foods will require very careful preparation; and in some cases may have to be altogether discontinued. In older children they may be cautiously employed, always watching the stools for signs of undigested material. No absolute rules can be laid down suitable for all cases; each case must be studied by itself.

In the treatment of infantile diarrhoea an absolute sterilized milk diet should be given, and the use of some mild alkaline water, such as that of Vals or Vichy, to which may be added some white of egg to form albumin-water.

Should the diarrhoea be so active as to deplete the patient to a dangerous extent hypodermoclysis or the subcutaneous injection of artificial serum or even of real serum should be employed. Lesage (*Revue de Thérap. Médico-Chir.*, Dec. 15, '96).

Cases that a change of climate after the regulation of diet and other treatments have failed to cure will often, apparently of itself, with the same identical diet and therapeutics, give rise to a rapid and complete recovery. McClanahan (*Jour. Amer. Med. Assoc.*, Aug. 5, '99).

We have before insisted upon the necessity of placing the patient under the most perfect hygienic conditions possible, and of securing abundance of fresh air. In the treatment of these cases our chief therapeutic reliance must be upon the administration of injections into the colon. Weak solutions of silver nitrate, if the bowels are thoroughly irrigated beforehand by simple sterile water, may prove of much service. The readiness with which this drug is decomposed appears to offer serious objections to its use. Preferable to it, in our opinion, will be found one of the salts of zinc (gr. iv-Oj), or tannic acid (gr. xxx-Oj),

or the fluid extract of hamamelis (3i-5ii to Oj), or the colorless fluid extract of hydrastis (3i-Oj). Any one of these may be employed as a high injection after thorough irrigation by the normal saline solution. Opium should be made use of only to moderate excessive peristalsis, and in these cases is best given in a little starch-water by rectal injection.

High rectal injections of value in the chronic diarrhoea of infancy in which there is a glairy mucous discharge due to an enteritis. In addition to ordinary water some extract of rhatany and mucilage of acacia may be injected. If there is any doubt as to the purity of the water, it should be boiled before it is injected. In other instances hypsulphite of sodium in the proportion of 2 drachms per pint of water, to which has been added a little mucilage of acacia, may be given night and morning in this manner, with advantage. *Dauchez* (*Revue Mensuelle des Sciences des l'Enfance*, May, '96).

The value of the administration of opium in this disease is a subject on which there has been much difference of opinion. All writers, however, agree that it should be avoided at the outset; but many indications for its employment, in our opinion, may arise during the latter stages of the disease.

Case of chronic diarrhoea in which petroleum emulsion proved of great value. A child, aged 2 years, when brought to the hospital was said to be having about twelve motions a day. The patient was given 2 drachms (8 grammes) three times daily of a medicine composed of equal parts of a simple chalk mixture and petroleum emulsion. At the end of a week the bowels were said to have been opened on an average from two to three times a day. There was then no petroleum emulsion in the dispensary and the child was given 1½ drachms (6 grammes) of the chalk mixture three times a day, but at the end of the second week the diarrhoea was nearly as bad as before treatment was commenced. One grain

(0.06 gramme) of betanaphthol was added to 2-drachm (8 grammes) doses of the chalk mixture, but at the end of another fortnight the bowels were still moved eight or nine times a day. The mixture containing 1 drachm (4 grammes) of petroleum emulsion was then given again and the frequency of the motions immediately fell to twice a day. *Fisher* (*Lancet*, Feb. 1, 1902).

Stimulants, in our opinion, are necessary in the majority of cases; they should be used cautiously at first, but liberally in the later stages of the disease. Good whisky and brandy are preferable to wines; aromatic spirit of ammonia may occasionally be of service in small frequently repeated doses. Caffeine may also be employed either in a single solution or in the form of a well-prepared tea or coffee.

In all instances where the temperature runs an elevated course we have much confidence in the value of hydrotherapy. This treatment may be employed in the form of cool baths, the cold wet pack, or cool irrigation of the intestines. Of the three methods our preference is for cool baths; whenever the temperature of the body rises above 102° F. the infant should be placed in a bath containing water at the temperature of about 95° F., which temperature should be quickly lowered to 90° F. or 85° F. A cloth wrung out of cold water should, at the same time, be kept on the head. The infant should remain in the bath from three to ten minutes; the duration varying according to the age and feebleness of the infant. It is to be remembered that infants are affected by a cold bath more promptly than adults, and are more easily depressed by it. Care should be taken, therefore, to watch its effects, and, if necessary, to use stimulants after it is over.

Great success in extreme cases of enteritis by the cold bath at a temperature

of 68° F. Brunon (La Normandie Méd., Aug. 1, '93).

A cold wet pack may occasionally with advantage replace the cool bath where circumstances are not convenient for the employment of the latter. Of late years the irrigation of the colon with cool water has been employed in cases of hyperpyrexia. It is unquestionably a more powerful method than either bath or pack, and when used with discretion may prove of more value. Its action, however, is less under the control of the physician than that of baths, and serious depression of the nerve-centres may result from the employment of too cold or too long-continued irrigation.

Should the prostration become extreme, or hydrencephaloid symptoms make their appearance, subcutaneous injections of a sterilized normal saline solution, as described in the article on CHOLERA INFANTUM, ought to be employed. In severe cases three or four injections a day of 30 cubic centimetres each should be given. Not only do these injections stimulate the flagging circulation, but they dilute the toxins in the blood and favor their elimination through the excretory organs; in many instances they check in a remarkable way the symptoms of nervous irritation.

DIETARY.—For the first twelve or twenty-four hours, according to the severity of the case, only cool sterile water should be permitted to the infant. After this period a weak sugar-of-milk solution may be given in small quantities to infants under three months; to those over three months a thin barley- or rice-water sweetened with sugar of milk may be allowed. Great caution must be exercised with all albuminous foods so long as the stools retain their offensive odor. White-of-egg or albumin-water forms an excellent method of administering an easily-assimilated proteid. To prepare it

the white of an egg is to be shaken up in a flask with from 6 to 12 ounces of water; the solution is then to be strained through muslin, and a little salt and sugar of milk added. A carefully-prepared whey may also be allowed, and is often relished. In older children raw meat-juice in small amount, a weak broth, or one of the peptonized foods may be administered with advantage. Milk in all forms should be forbidden until the stools begin to assume a normal appearance; its employment should then be resumed only gradually. As Siebert has emphasized in a recent paper, under-feeding of the infant with milk-sugar solution, thin gruel, or strained soup can do little harm; while milk even in small quantities can aid the infection, but not the nourishment of the body.

HYGIENE.—During the attack the infant should, as far as possible, be confined to its cot. Soft unirritating flannel should be worn next the skin. Great care should be exercised lest the buttocks become irritated by the discharges, diapers should be changed promptly as soon as soiled, and the application of some greasy emollient will frequently prevent the development of the erythematous and sometimes ulcerative condition which in these cases is so liable to occur. The infant should be allowed all the fresh air possible. As soon as the violence of the attack has passed off, it should be sent, if practicable, either to the sea-side or to a bracing country- or mountain-air.

INFLAMMATORY DIARRHOEA IN WHICH IN ADDITION TO THE SYSTEMIC INFECTION THE SYMPTOMS OF AN ACUTE LOCAL INFLAMMATION HAVE A PROMINENT PART—ACUTE ILEOCOLITIS (HOLT).

Symptoms.—The symptoms in this form of disease generally commence abruptly, and for the first few days

closely resemble those of the preceding form. The vomiting, however, is not generally persistent: the temperature, although high at the onset, soon falls, and remains about 102° F., and the motions are of a greenish or greenish-yellow color and very frequent. After two or three days the discharges assume a more characteristic appearance. They become small in amount, are of a grass-green or brown color; contain a large quantity of mucus; a variable amount of blood; and are passed with much pain and straining. Such stools may either have a comparatively slight odor, or a distinctly putrid and offensive one. Under the microscope, undigested material, epithelial cells, pus-corpuscles, and streptococci, with other forms of bacteria, are seen.

The abdomen may now show signs of slight distension; tenderness on pressure may be elicited along the course of the colon, and the urine, if collected, may show the presence of a small amount of albumin. As the disease progresses the severe straining frequently leads to a distinct prolapse of the bowel.

If proper measures have been employed, the severity of the symptoms generally begins to subside toward the end of the first week. The motions now diminish in frequency: they no longer show signs of blood; pain and tenesmus lessen, and the mucus decreases in amount. In many cases, however, recovery is slow, and relapses on the slightest indiscretion are liable to take place. Much care is necessary lest the inflammatory process go on to ulceration.

The persistence for two or three weeks of brown mucous stools with moderate pyrexia, and a failing nutrition are, according to Holt, indicative that ulceration has taken place.

In the more recent form the temperature remains steadily high; the motions

are very frequent and contain much blood; and the infant quickly falls into a typhoid state in which stupor, delirium, or convulsions are liable to occur. If the case survive, the symptoms may moderate; but prostration is extreme, and some pulmonary or cerebral complication is apt to turn the scale on the wrong side. Some ulceration is almost always present in these cases, retarding recovery for many weeks. A long period, during which careful dietetic and medicinal measures must be faithfully employed, may still reappear before complete restoration to health is secured.

The membranous type if the disease is fortunately of rare occurrence. In this form the symptoms are of an alarming character from the very outset. Not only do the stools contain much blood and mucus, but an examination of these under water may reveal numerous shreds, and sometimes large patches of pseudo-membrane. Pronounced nervous symptoms, such as stupor or convulsions, may at the onset mark the symptoms of local inflammation. These cases run a severe course, typhoid symptoms develop early, and recovery is comparatively rare.

In some cases which for the first two or three weeks have shown symptoms of gastro-enteric infection rather than of local inflammation, owing either to the feeble constitution of the infant or to the intensity and duration of the local irritation, a follicular ulceration develops, and symptoms of local inflammation make their appearance. The motions now become small, slimy, and, to a variable extent, tinged with blood; their color is most frequently of a dark green or brown, and their odor usually offensive. Pain at this stage, though present, is no longer so prominent a feature as during the earlier stages of the disease; pyrexia is only moderate; the motions are not

very frequent, but the strength of the infant gradually fails, and the general emaciation becomes very noticeable. Under the microscope the stools are seen to contain epithelial cells in large numbers, numerous leucocytes, and streptococci associated with bacilli.

The course of these cases is generally downward. Exacerbations and relapses are easily excited. Only the few recover completely, and in these convalescence is always slow. The fatal result is frequently hastened by some intercurrent disease.

Diagnosis.—Like the preceding, this form of inflammatory diarrhœa is to be distinguished from intussusception. It is important to remember that with intussusception, although we may have vomiting, bloody stools, and tenesmus, we have no pyrexia. Later on, the absence of fecal matter in what passes from the bowel, the tenesmus, the tympanites, the stercoraceous vomiting, and the slowly rising temperature complete a picture quite different from that of an ileocolitis. Typhoid fever, as we have before mentioned, very rarely presents itself in an infant.

A diagnosis of the presence of ulceration is to be made from the whole character of the case, rather than from any one special symptom. Where mucous stools persist for several weeks with only moderate fever, but with distinct wasting and loss of strength, a condition of ulceration is more than probable.

Prognosis.—The prognosis must be greatly dependent on the vitality and strength of the infant, upon the hygienic and dietetic conditions that can be secured, upon the severity of the attack, and upon the season of the year. Delicate infants under unhygienic conditions generally succumb early. Continuous high fever, the presence of a large

amount of blood in the evacuations, severe nervous disturbances, and symptoms indicative of extreme feebleness of the circulation are always to be regarded as unfavorable.

Treatment.—The same measures are to be employed at the outset in this group of cases as in the preceding. Milk and all milk-foods are to be forbidden. A full dose of castor-oil or an effective dose of calomel is to be promptly administered, and followed within a few hours by copious irrigations of the colon with tepid saline solution (sodium chloride, 1 ounce; water, 1 gallon). The compress over the abdomen, which we have already advised as an excellent sedative, should also be applied. After the second or third irrigation of the intestines, should painful straining persist, a small quantity (3ii-3iv) of a thin starch solution, to which from 1 to 3 drops of tincture of opium, according to the age of the infant, has been added, should be gently thrown into the rectum, with the object of moderating excessive peristalsis and lessening tenesmus. These opiate injections may be repeated, if necessary, once or twice daily. Should the stools contain a large amount of blood, rectal injections of hot water, 106° F., to which a small amount of fluid extract of hamamelis has been added, may be administered for ten or fifteen minutes at a time, allowing the fluid to escape without hindrance. Tannic-acid and weak nitrate-of-silver solutions have both been recommended for use in this acute stage. We consider them of more advantage after the acute symptoms have, to some extent, subsided.

Internally, during the first few days of the acute stage a mixture containing castor-oil, in from 3- to 10-minim doses, associated with ipecac, and small doses of an opiate given at intervals of two or three hours, is strongly recommended by

many writers, and has in our hands been of apparent benefit. Later, one of the insoluble preparations of bismuth, to which we have before referred, should be given in full doses suspended in a mucilage with some aromatic water. Other and more powerful antiseptics may in some cases be employed. Stimulants are required in the majority of cases. Old brandy or whisky forms one of the best, and, given well diluted in a little sweetened or albumin-water, is acceptable even to the youngest infants.

All that we have said in the preceding section in reference to cool baths, dietary, and general hygiene is equally applicable in this class of cases.

Fifty-two children with grave diarrhoeas treated with serum obtained from asses after injecting colon bacilli from virulent milk or stools. Twenty-six children had no marked symptoms after 48 hours, fourteen were improved, twelve unimproved. In all cases where the stools were green the color disappeared after the injections. The serum obtained after treating asses with the colon bacilli normally present in stools did not give these results. Lesage (*Rev. de Thérap. Méd.-Chir.*, No. 24, '96).

Between sixty and seventy cases of "summer diarrhoea" treated in children ranging in age from a few weeks to three years. The cases were in every way such as are met with in the crowded tenements of large cities during the heated term. Lactic acid was used in every case. The maximum dose was $1\frac{1}{4}$ grains, given every hour. The result was the disappearance of all symptoms in from twenty-four to forty-eight hours. The only medicine given besides the lactic acid was an initial dose of calomel in cases where it was indicated. Bowles (*Indian Lancet*, Apr. 1, '97).

Eudoxin, which contains 52.9 per cent. of iodine and 14.5 per cent. of bismuth, recommended in the treatment of infantile diarrhoea. The remedy is harmless, and can be administered in doses of 1 grain every hour to a child a year old.

M. Elerzarian (*N. Y. Med. Jour.*, No. 1029, p. 270, '98).

Eudoxin successfully used in the treatment of 63 cases of infantile diarrhoea. Of these, 2 died: 1 patient with acute dysentery, seen on the tenth day, and 1 patient, aged 9 months, with acute ileocolitis. Recoveries took place: 38 in 24 hours; 12 in 2 days; 2 in 3 days, and 6 in 4 days. The dose for infants is 2 to 3 grains; for children of 5 to 10 years, 3 to 5 grains. Blech (*N. Y. Med. Jour.*, July 8, '99).

Tincture of iodine, also praised by Grosch and Stahan, highly recommended. It may be administered as follows:—

℞ Tincture of iodine, 5 to 15 drops.

Distilled water, 5 ounces.

Syrup, 6 drachms.

A teaspoonful every two hours.

This should be preceded by a purgative dose of castor-oil or of calomel. Speedy results are obtained. Cattaneo (*Pediatrics*, Oct., '99).

The solution ordinarily chosen for rectal irrigation is the normal salt solution prepared by adding 1 teaspoonful of common table-salt to the pint of water and using from 1 to 2 quarts at each irrigation, which is given as follows: A fountain-syringe and a soft-rubber catheter of medium size are used. To prevent the curling of the catheter upon itself, its tip should be immersed in oil and introduced a short distance into the bowel, when water should be allowed to flow, thereby dilating the bowel and facilitating the entrance of the catheter. When the bowel is well distended by the solution, as evidenced by a return-flow, or upon examining the abdomen and finding it tense, the catheter should be detached from the syringe and left in place to permit the escape of water. In the same way medication can be directly applied to the highly inflamed mucous membrane. The bowel should first be cleansed by the normal salt solution before using any medication locally. Loach (*Memphis Med. Monthly*, Jan., 1900).

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INFANTS, FEEDING OF. See NURSING AND ARTIFICIAL FEEDING.

INFANTS, SCORBUTUS OF. See SCORBUTUS, INFANTILE.

INFLUENZA.—From the Italian, *influentia*: a mysterious influence.

Definition.—Influenza, “*la grippe*,” or epidemic catarrh, is an acute febrile affection generally accompanied by severe nervous and catarrhal symptoms, and often extending rapidly over many countries and attacking large numbers simultaneously, but resulting in a low ratio of mortality.

Symptoms.—Epidemic influenza is remarkable for the suddenness of its attacks and the number of persons affected at the same time. There is no well-defined period of incubation, and generally no prodromic stage. Persons apparently in good health and engaged in their ordinary occupations are suddenly attacked with sensations of coldness, often increasing to a chill, with general depression and severe pains in the head, back, and limbs. The surface looks pale, the pulse and respiration variable, but these symptoms soon give place to distinct febrile reaction, some flushing of the face, general feeling of soreness of the muscles, and increased intensity of pains everywhere, with great sense of weakness.

The pulse and respirations increase in frequency, and the temperature generally ranges from 38° to 40° C. The skin is dry, the urine is scanty and high colored; there is constipation, no appetite, but some thirst. In a large majority of cases before the end of the first twenty-four hours the vessels of the conjunctivæ become red, accompanied by active congestion of the lining membrane of the nostrils, pharynx, and bronchial tubes, with

cough and oppression in the chest. At first the cough is dry and harsh, causing some pain in the chest, and, in some cases, severe pain in the region of the frontal and maxillary sinuses. During the second day the congested membranes begin to secrete a thin, almost water-colored mucus that flows from the nostrils and renders the cough less dry, and on the third and fourth days the nasal discharge and the expectoration become more opaque or muco-purulent, causing more or less moist rhonchi in the chest. At the same time the pains in the head, back, and limbs and oppression in the chest become less severe, expectoration more free, temperature lower, especially during the morning hours, and by the end of the week the skin becomes bathed in perspiration, the kidneys secrete more urine, and convalescence begins.

A day or two after the invasion by influenza the tongue is coated with a white, opalescent fur, covering its centre. It is the last symptom to disappear, and as long as it remains, even if only as a whitish triangle at the base, the disease has not run its full course. This white fur is strongly acid in reaction to litmus. D'Hotel (*Jour. de Méd. Interne*, May 1, '99).

In mild cases the patient usually quickly recovers his health and strength, but in those of greater severity, though the general febrile symptoms disappear at the end of the first week, the inflammation of the mucous membrane of the air-passages continues, perpetuating copious muco-purulent discharges from the nostrils, with some cough and expectoration, and the patient remains debilitated several weeks or even months.

In influenza of childhood there is a period of depression with some nasal catarrh, and slight dry cough preceding the onset of the fever. It may last eight or ten days. The onset of the pyrexia is marked by shivering, the voice becomes hoarse, deglutition is sometimes painful,

the nasal catarrh increases, and there is some dyspnoea. Constipation is the rule, and in many cases there is severe headache, though, in infants, this may be replaced by convulsions. Furst (Scalpel, No. 16, '97).

Seven cases of influenza in adults, distinguished by extremely-copious sweats and a marked tendency to the formation of adipose tissue. The cases commenced with bronchial disturbances; some were accompanied by distressing cardiac palpitations, all with constipation, lack of appetite, and scantiness of urine. The sweats continued for months and left a neurasthenic condition, which in some cases persisted for years. The sweats and bronchial disturbances alternated, one diminishing as the other increased, and *vice versa*. Marquie (Jour. de Méd. de Bordeaux, Apr. 16, '98).

Epidemic of influenza, affecting 70 per cent. of the inhabitants of a rural district in Italy containing 2000 inhabitants in which, prior to the epidemic, only 2 or 3 cases of pneumonia were observed. Nineteen out of 36 cases of pneumonia proved fatal; in these the hæmorrhagic tendency was marked. Epistaxis was observed in many cases. Menorrhagia was common even in virgins; some patients previously suffering from amenorrhœa sought treatment for menorrhagia. V. Grossule (Gaz. d. Osp. e delle Clin., No. 27, 1900).

In severe cases, when at the climax of the active stage, the inflammation often extends through the bronchial tubes to the air-cells and connective tissues of the lungs, thereby developing all the symptoms of broncho-pneumonia as a complication of the original disease.

The relation of influenza to pneumonia is that of a predisposing factor only. Prudden (Med. Record, Feb. 15, '90).

The course of pneumonia complicating influenza is seldom that of the typical disease; it rarely sets in with a decided rigor, and the inflammatory symptoms, notably the pain in the side, are but little marked. The local processes are not characteristic. Local signs are not detectable before the third or fourth day.

Crepitation will be heard over a considerable area, soon disappearing and becoming evident at another. Not often does the process reach hepatization with definite dullness. Typical rusty sputum seldom observed. Crises are rare. The course of inflammation is milder, dyspnoea and rapid infiltration being wanting. Leyden (Berliner klin. Woch., No. 10, '90).

Malignancy found characteristic of the pneumonia complicating influenza, seven of fourteen cases terminating fatally. Sokolowski (Inter. klin. Rund., Apr. 13, '90).

Pneumonia of influenza considered as a broncho-pneumonia. It presents the following distinctive features: 1. Evidence of a preceding attack of influenza is generally present. 2. Percussion-dullness may be absent or only present for a short time, shifting its position; bronchial breathing may be the only physical sign; moist sounds are most constantly present. 3. The sputum is never typically rusty. 4. The fever usually sets in without shivering, and the temperature rises gradually. 5. The course is less acute, the infiltration disappears slowly, and convalescence is retarded. Albu (Deutsche med. Woch., Feb. 15, '94).

Three cases of influenza-pneumonia which progressed to gangrene. Rhyner (Münch. med. Woch., Nos. 9, 10, '95).

Case of influenza-pneumonia followed by unmistakable signs of abscess of the lung, in which Pfeiffer's bacillus was the only organism found in the sputum. Hitzig (Münch. med. Woch., No. 35, '95).

Peculiarities of broncho-pneumonias of influenza in children: (1) slight elevations of temperature seem to point to paralysis of thermogenic centres; (2) early tendency to bronchoplegia and pulmonary collapse due to depression of vital powers; (3) extraordinary slowness of course of disease. Ferreira (Revue Men. des Mal. de l'Enfance, Mar., '95).

Influenza-pneumonia is characteristically lobular, the inflammatory process spreading from the bronchi to the alveolar passages and alveoli, the latter being densely and almost exclusively filled with leucocytes. In the bronchi their number is so great that they not only penetrate

between the epithelial cells, but cause partial detachment of the epithelial lining. The absence of fibrin is noteworthy, and is one of the reasons why the infiltration has, to the naked eye, a smooth appearance.

As a terminal stage of influenza pulmonary gangrene occurred in 7.5 per cent. of the writer's cases of influenza-pneumonia. Arteriosclerosis may follow influenza. A. Fraenkel (Berliner klin. Woch., Apr. 12, '97).

The influenza bacillus is capable of giving rise to fibrous or serous, or even hæmorrhagic, exudate in the lungs, which may become purulent. When the sinuses communicating with the nose are inflamed it is nearly always a result of infection with the influenza bacillus. Lindenthal (Wiener klin. Woch., Apr. 15, '97).

Epidemics of influenza are followed by an increase in the number of chronic heart diseases resultant from acute endocarditis. Schott (Berliner klin. Woch., June 4, 1900).

Post-tracheal hæmorrhage several times observed. In all the cases except one there was a more or less recent history of influenza and of more than one attack. The tickling in the lower part of the throat, and constant feeling of "something" that must be "got up," was complained of by all, together with the short, dry cough, which is all the more persistent the more recent the influenza. There is no elevation of temperature unless influenza is still present; very often not even then. It is sometimes only attributable to the influence of alarm or of loss of blood if the hæmorrhage has been severe, and is generally only temporary, and the chart presents none of the characteristics found in incipient phthisis. James Donelan (Jour. of Laryn., Rhin., and Otol., Jan., 1901).

Such a complication has been much more frequently manifested in childhood and old age than in the middle period of life. And it is one of the chief causes of the mortality attributed to influenza. Croupous pneumonia and pleurisy some-

times, though rarely, occur as complications in this disease.

Among the mild forms of influenza there are afebrile types without any inflammation, yet with such profound influence on the nervous functions as to cause much moral, physical, and intellectual depression. As influenza is one of the most powerful factors in lowering the resisting power of the body, these mild types should be recognized and the patient made to avoid contact with tuberculous or other sick people. The skin, liver, and kidneys must be kept active, the stomach and intestines being treated by alimentation rather than by drugs. The mouth and nose should be cleansed by a solution of formol, menthol, or carbolic acid. H. Huchard (Bull. de l'Acad. de Méd., Mar. 5, 1900).

Those who still underestimate the malign effect of influenza on the public health would do well to ponder certain statements printed in Chicago's Bulletin of the Health Department for the week ending April 4th. Dr. Reynolds informs us that during "the first four months" of 1903—we presume he means the first three months—influenza was more prevalent in Chicago than at any time since 1891. The number of deaths from all causes in the month of March, 1903, exceeded the number in the same month of 1902 by 350, and there were 330 deaths due, not directly to influenza, but to influenza as a complication of such diseases as pneumonia, consumption, Bright's disease, heart diseases, bronchitis, measles, and whooping-cough, "in about this order of frequency." Of course it is only the laity who underrate the malignity of influenza, and we are glad to see that the Chicago department is pushing its campaign of education in regard to the disease. Editorial (New York Med. Jour., April 18, 1903).

In some of the wide-spreading epidemics of influenza, more especially those commencing during the summer and autumn months, there have been less symptoms of inflammation of the respiratory mucous membranes, and more

in the membranous lining, the stomach, and viscera of the abdomen. Such was the case in very many of the attacks during the epidemic commencing in the autumn of 1889 and recurring to some extent almost every year since. There was the same suddenness of the attacks, and the same severe pains, not only in the head, back, and limbs, but in the epigastrium, with tenderness to pressure in different parts of the abdomen, nausea, and occasional vomiting and a disturbed condition of the bowels. The evacuations both from the stomach and bowels, though not frequent, were generally mixed with mucus sufficient to show a catarrhal grade of general fever present, and sometimes led the practitioner to suspect that his patient was affected with typhoid fever during the first few days of his attendance.

In a few cases the abdominal symptoms centered more in the region of the duodenum and hepatic ducts. This was indicated by constant nausea, occasional vomiting, scanty and high-colored urine, yellow or jaundiced hue of the conjunctiva and skin, with much epigastric distress and general weakness.

In another class of cases the predominant symptoms are limited to the nervous structures of the body, and consist in not only violent pains and moderate general fever, but a general hyperæsthesia throughout the cutaneous and muscular structures of the body. Muscular movements, both voluntary and involuntary, are painful. These give rise to a distressed feeling of constriction around the chest and soreness, with much pain in different parts of the line of attachment of the diaphragm, the pectoral muscles, and in the region of the heart. Both cardiac and respiratory movements are variable or irregular, a feature adding much to the general sense of prostration.

In a few instances it has caused feelings so closely resembling those in angina pectoris as to greatly alarm the patients.

Affections of the heart are far more common than those of the vessels. The cardiac affections may concern the nervous mechanism of the heart, or the heart-muscle and its lining membrane. In the former group stands heart-failure; in some cases this is the first indication to the patient that anything is amiss; in other cases it occurs during the febrile stage, and in yet others during convalescence. Disorders of rhythm are very frequent, and include tachycardia, bradycardia, and arrhythmia, which may take the form of intermittence, irregularity, or regularity with sudden changes of rhythm. Anginal attacks are occasional. In the second group of affections, those concerning the heart-muscle and its membranes, endocarditis stands out pre-eminently. The inflammatory diseases of the heart principally co-exist with a pulmonary complication, especially broncho-pneumonia. Endocarditis may be of simple or malignant type. Pericarditis is found, and may be dry, serous, sero-fibrinous, or purulent. Among diseases of vessels, venous thrombosis, arterial thrombosis, and arterial embolism have been described. Venous thrombosis is usually met with in the second or third week, in cases with prolonged fever, and before convalescence has set in. The femoral is the vein most often concerned. Lateral sinus-thrombosis is due to conveyance of septic material from the throat to the middle ear, and reaching the sinus through the mastoid cells. Arterial embolism and thrombosis have been described in many situations. Jordan (*Med. Chronicle*, Feb., 1902).

In this class of cases especially, and to some extent in all severe cases of each cavity, the functions of the cardiac, vasomotor, and respiratory nerves remain impaired for a long time after general convalescence is established. Consequently the patients do not regain ability to take active physical exercise without short-

ness of breath, palpitation, and a sense of great weariness for months—and, in some, years—after the original attack. All the varieties of influenza have, in rare instances, been complicated with inflammations of the brain or its membrane, of the endocardial structures, the urinary organs, and even the uterus.

Meningitis may arise directly as a result of the general infection, in which case it occurs during the progress of the disease; or secondarily to otitis, in which case it occurs after the influenza has disappeared. The myelitis of influenza may be diffuse or systemic. The most frequent variety of the former has been transverse dorsal myelitis.

The complications of the peripheral nervous system are the most common, and, among these, neuralgia takes first rank. Trigeminal neuralgias are most frequent. Disorders of motility are much less common than those of sensibility. Influenza may reawaken neuroses from which the patient has long been free, exaggerate existing or even provoke the explosion of neuroses in those who have never been affected. These nervous complications distinguish influenza from dengue. De Brun (*La Méd. Moderne*, Nov. 13, '90).

Case of hæmorrhagic nephritis noted consecutive to gripe, in a woman 32 years of age, the hæmaturia lasting three weeks. Thorough recovery ensued. Bock (*Deutsche med.-Zeit.*, Apr. 2, '94).

Renal congestion and inflammation of frequent recurrence in the course of influenza; diagnosis greatly facilitated by the use of the centrifuge. These conditions appear at the same time as those that occur in the course of diphtheria and typhoid fever, and are in each instance probably due to the toxins of the respective diseases. Microscopically the urine under these circumstances contains a small amount of blood, with hyaline casts strewn with granular matter and epithelial cells, and also granular casts of the thin variety. In the nephritis of scarlatina, on the contrary, the casts are of the wider variety. In the majority of case recovery ensues in from two or three weeks to two or three months. Some,

however, pursue a chronic course. A. Jacobi (*Med. News*, June 8, '95).

Renal lesions are not infrequent following influenza. Besides transient albuminuria has been observed acute degeneration of the kidney, acute inflammation, both forms of chronic diffuse nephritis, acute hæmorrhagic nephritis, and persistent albuminuria not belonging to any of these groups. The number of applicants rejected for life-insurance has perceptibly increased since the advent of influenza in epidemic prevalence. G. Baumgarten (*Med. News*, June 8, '95).

Several cases of albuminuria in patients free from renal trouble before influenza. So-called healthy albuminuria becomes more serious after influenza, and casts appear in the urine. James Tyson (*Univ. Med. Jour.*, July, '95).

The poison acts very often on kidneys. In the simplest cases of influenza there is sometimes severe inflammation of glomeruli, with slight albuminuria, which lasts for several days, then disappears. In other cases it produces serious nephritis, which from the start exposes the patients to renal insufficiency and death from uræmia. Lamarque (*L'Union Méd.*, Sept. 28, '95).

A chronic form of influenza must be recognized which consists of two types: (1) a type characterized by permanent fever of a remittent or intermittent character, that is prolonged for several months, and followed by (2) a return of the disease for brief periods of time. Chronic influenza may also develop without the least elevation of temperature. Nil Filatow (*Annales de Méd. et Chir. Infantiles*, Apr. 1 and 15, '99).

In influenza rapid dilatation of the heart frequently occurs within a day or two after the onset of the disease, and it sometimes causes fatal syncope. It is certain that the dilatation caused by influenza may remain as a permanent dilatation, and may give rise to very serious symptoms. Thrombosis is also of frequent occurrence after influenza: probably due, in part at least, to the enfeeblement of the heart. Minor degrees of dilatation may cause merely a feeling of incapacity for exertion. Active exertion may do such a patient

much harm, and any prolonged strain may be followed by an acute breakdown. D. B. Lees (*N. Y. Med. Jour.*, Jan. 19, 1901).

One writer states that, in 27 cases of the disease occurring in pregnant women under his observation, abortion or miscarriage took place in 17.

Series of 159 cases of influenza observed, 138 in the non-gravid and 21 in the pregnant condition. Of the latter, pregnancy was interrupted in 17 cases, and in 4 continued its course. The 138 non-gravid cases showed in all, with the exception of 3, alterations in the generative functions—partly by menorrhagia, partly by metrorrhagia, partly by exacerbations of already-existing sexual pains. Hæmorrhagic form of endometritis set in which led, in the pregnant state, to abortion or interruption of the pregnancy. Rudolf Müller (*Münch. med. Woch.*, Oct. 8, '95).

Of the four clinical forms—the purely febrile, the nervous, the catarrhal, and the gastric—women suffer most from the first two. Symptoms connected with the genital organs are very common, and menorrhagia and intermenstrual discharge are frequent. Pre-existent diseases, such as endometritis, congestive or infectious, show exacerbations.

In a school, chlorotic and anæmic girls in whom menstruation was irregular, the flow became and continued regular after an attack of influenza.

Pregnancy and labor were commonly gravely affected, and many abortions and premature labors occurred during the several epidemics. Labor-pains were weak and specially painful, and the confinement was prolonged. Gabriel v. Engel (*Wiener med. Press.*, Nos. 43, 44, '96).

Attention called to the fact that, during the 1890 influenza epidemic, the number of births in Hungary was 41,866 less than during previous years, and during the following three years; during September and October alone in 1890, there were 19,768 less children born than in the same months of other years. Engel (*Centralb. f. Gynäk.*, No. 24, '97).

When influenza attacks a woman about to be confined, the labor frequently proves a very tedious one, with considerable uterine inertia. Excessively bloody and offensive lochia at times continue for weeks beyond the normal duration, induced, very likely, by a diminution of the normal post-partum involution of the uterus. Ameiss (*Amer. Jour. of Obstet.*, Apr., '99).

Twenty-one cases of influenza observed in a maternity clinic during pregnancy and labor. One case ended in abortion. In 10 instances the labor came on during an attack of influenza, and in 5 of these at the beginning of the ninth month. The uterus is likely to be quickly exhausted and it must be stimulated. Puerperal hæmorrhage was common. G. Moller (*Deut. med. Woch.*, July 19, 1900).

Influenza in childbed generally appears in a mild form about the third or fourth day after presumable infection, but occasionally later,—up to the ninth day. Its course may be marked by slight, moderate, or high fever, and each type, especially in childbed, is prone to two or more relapses. The frequency of the pulse corresponds with the height of the temperature, yet does not become extreme save in cases of serious pulmonary affection. When there are no marked local symptoms it may, especially in mild cases, be mistaken for puerperal fever, the comparative slowness of the pulse and the occurrence of a relapse may be of service in the differential diagnosis; fœtid lochia, subinvolution, and tenderness on pressure are commonly met with in influenza, and therefore are not important in this respect. If no culture research can be made, information as to the existence of a prevailing epidemic or pandemic is often indispensable for correct diagnosis. Stolz (*Monats. f. Geb. u. Gyn.*, Bd. xiii, H. 6, 1901).

One of the most constant and important influences accompanying epidemics of influenza is a marked impairment of vitality or vital resistance, as shown in continued loss of strength and endur-

ance, mental despondency, and increased attacks of bronchitis, pneumonia, and tuberculosis, not only during its active prevalence, but for many months thereafter.

Influenza is responsible for none of the cases of true psychoses, inasmuch as in 104 cases only 21 were found in which neither hereditary tendencies nor alcoholism nor neurotic temperament was absent. Jolly (*Deutsche med. Woch.*, Mar., '91).

Neuritis of the optic nerve due to *la grippe* is of relatively rare occurrence; it may affect one or both eyes, and may produce partial transient impairment of vision, partial permanent impairment of vision, or absolute permanent blindness. Failure of vision begins from three to fourteen days after the commencement of the attack of *la grippe*, and proceeds rather rapidly. It is always preceded by intense frontal or circumorbital cephalalgia. Treatment has but little effect to promote a cure. If recovery follows, it takes place spontaneously and accompanies improvement in the patient's general condition. Weeks (*N. Y. Med. Jour.*, Aug. 8, '91).

Fifty-four cases of insanity following influenza. About one-fourth may be classed among the cases of febrile delirium. They begin as acute hallucinatory confusion, contemporaneous with the fever, and disappear several weeks after the latter has subsided. The post-febrile cases may be divided into three classes. 1. Asthenic psychoses with hallucinations and delusions, sometimes exaltative, at others depressive. 2. Melancholias, from simple neurasthenic or hypochondriac disturbance to profound stuporose conditions. 3. The manias. The prognosis is good. Kirn (*Allgemeine Zeitsch. f. Psy. u. Psy.-gerichtliche Med.*, B. 48, '92).

From the study of twenty-seven reported cases of papillary and retrobulbar neuritis, following influenza, the following conclusions are drawn: 1. The virus of influenza may attack the optic nerve in its papillary or in its retrobulbar portion. 2. The ocular lesions of influenza may be divided into those produced by

infection from the exterior and those caused by metastasis. 3. The papillitis, due to influenza, appears in from three to fourteen days after the commencement of the disease. 4. Retrobulbar neuritis is more common than papillitis or neuroretinitis. It differs from the neuritis due to alcohol, tobacco, or lead, in that it presents an acute or a subacute form, marked by a rapid and progressive diminution of vision. Prognosis should be guarded, improvement being slow, sometimes, though exceptionally, being complete. During the acute stage leeches to the temples, absolute rest, injections of pilocarpine, quinine, and salicylates internally should be employed. In the later stages iodide of potassium, the continuous current, injections of strychnine into the temples, and mercury are indicated. Antonelli (*Recueil d'Ophtal.*, June, '92).

The nervous and mental consequences of influenza in the majority of cases are poisoning by some ptomaine produced by the bacteria of the disease. P. C. Knapp (*Boston Med. and Surg. Jour.*, Sept. 15, '92).

Case of bilateral neuritis of the brachial plexus suddenly followed influenza. Complete paralysis of the arms occurred, with atrophy and reaction of degeneration in the paralyzed muscles. The father of the patient had been similarly affected in the lower members also after influenza. M. A. Claus (*Jour. de Méd., de Chir., et de Pharm.*, May 26, '94).

Two cases of cerebral sclerosis following influenza. Rendu (*Le Prog. Méd.*, Jan. 5, '95).

Case in which several weeks after influenza, when weather extremely severe, patient noticed paralysis of muscles supplied by facial nerve, first left side then right. Brother and father had had facial palsy. W. J. Barkas (*Lancet*, Jan. 26, '95).

Aphasia observed in the course of influenza pneumonia. Pailhas (*Arch. de Neurol.*, May, '95).

Influenza is a specific nervous fever and, like cerebro-spinal fever, is infectious. Backache, spinal; headache, delirium, tinnitus, etc., due to implication of cranial nerves; vomiting and diarrhoea

probably reflex; complications mainly nervous. H. Waite (Brit. Med. Jour., June 22, '95).

Case of transitory aphasia following influenza. Dargelo (Nouveau Montpellier Méd., July 20, '95).

Man, aged 40, a tailor, alcoholic and very neurotic, had been under personal observation during the last and the present year, suffering from a recurrent desquamative affection of the skin following influenza.

In February, 1895, he had a typical severe attack of influenza, and was in bed a month with it. He does not think he had any rash. In the beginning of March his hands and feet began to peel and his nails to become dry and brittle. He came under observation on March 21st, when the following note was made: "Over both hands the epidermis is peeling off in large sheets, especially from the fingers, leaving the subjacent skin healthy. There is hypertrophy of the nail-bed of all the fingers, and especially of the thumbs, where the piling up of epidermis is so great as to threaten the vitality of the nail. There is a similar desquamation of the soles and similar changes in the toe-nails, but less marked. The man is in a marked condition of post-influenzal neurasthenia."

Subsequently all his nails fell off, and were replaced by new nails with prominent transverse ridges. His nervous prostration persisted; he complained of persistent "paralytic feelings" in the fingers, and disordered sensation. Finally he became profoundly melancholic, but improved greatly at a convalescent home at the sea-side.

He had another attack of influenza in October, 1895, followed by similar changes and total loss of nails, and again in February, 1896. Recently he had a fresh attack, called "bronchitis," and he returned to the hospital on November 4th with desquamation of all the fingers, although more marked in some than in others. There is, on examination, no anæsthesia, but some loss of tactile sensibility. J. J. Pringle (Brit. Jour. of Derm., Dec., '96).

In some cases presenting otalgia the subjects had moderate fever, but the

aural pain was intense, and lasted from three to nine days. No evidence of an inflammatory process could be observed on examining the ears. These cases believed to be examples of pure otalgia, constituting an abortive form of epidemic influenza. D. Kaufmann (N. Y. Med. Jour., Feb. 13, '97).

The great majority of cases of multiple neuritis following influenza are, in reality, instances of peripheral neuritis, an intoxication of the nerve-trunks; this may be sufficient to produce rapid destruction of the nerve-fibres or just enough to cause pain by irritation. This is sustained by the fact that the salicylates are useful in these cases, owing to their power of promoting the elimination of some toxic agents. H. B. Allyn (Jour. Amer. Med. Assoc., July 24, '97).

A case of sclerosis of the tongue of influenzal origin. The middle portion of the tongue was of a wooden hardness. This condition followed an attack of influenza in a person of middle age. The pathological change involved the cheeks also. Iodide had no effect upon the disease. Another case was described in which the tongue had assumed an atrophic and mammillated state after an attack of the same affliction. M. Courtade (Laryngoscope, Jan., '98).

The most common of nervous sequelæ is neurasthenia. The neurasthenia following influenza differs but little from the various recognized types of this affection. We meet with the cerebro-spinal, the spinal, and the sympathetic type. A noteworthy feature of the cerebro-spinal type is the great depression, amounting to melancholia, with suicidal tendencies; so that the term neurasthenia no longer applies to this affection.

The spinal form of neurasthenia is a less common sequel of influenza. In a few cases observed it was accompanied by marked symptoms of hysteria.

In the sympathetic variety we meet with a group of symptoms, some relating to the heart, others to the sexual organs. Bradycardia, with a slow pulse of 40 or 50, is often observed to occur with influenza; we meet with an irregular or intermittent pulse accompanied by attacks of syncope; occasionally also attacks of

the nature of angina pectoris have been noted following influenza, where there was neither gout nor arteriosclerosis, or any other palpable cause for the attacks. In some cases the myocardium is most likely also affected, which may account for the sudden death occurring after influenza.

Among the post-influenzal nervous affections of an organic nature is most important peripheral neuritis. Various forms of peripheral neuritis have been observed. In a few cases all four extremities are affected.

Much more common than the former is a more limited neuritis, affecting sometimes only one limb or the two limbs on one side. The affection comes on some days or a week after the recovery from the influenza, the patient complaining of more or less severe pain in the limb, some weakness of certain groups of muscles comes on; in the lower extremities the anterior group of muscles of the leg and flexors of the knee are mostly affected; in the upper extremities the scapulo-humeral muscles, or sometimes the extensors of the wrist and fingers become involved; there is generally, also, *dissæsthesia*; the reflexes are first increased, afterward diminished, but rarely become quite absent. Recovery is generally very slow.

A third form resembles diphtheritic paralysis. Here there is paresis of accommodation, and in some few cases pharyngeal and laryngeal paralysis, and it is perhaps a nuclear affection rather than a peripheral neuritis. J. Dreschfeld (*Med. Chron.*, Mar., '98).

Meningitis and pseudomeningitis may occur as the direct or indirect result of influenza. In attempting to differentiate an influenzal meningitis from other forms useful criteria may be found: (1) in Shelley's sign (the presence of a sagolike looking eruption on the palate and lips); (2) in the influenzal tongue,—a peculiar opaline, bluish-white, porcelain-like appearance, which resists purgative treatment, and lasts throughout the disease; (3) in the study of the temperature, which presents irregular rises, each rise a little less than the preceding, and with marked oscillations between the

morning and evening temperatures; (4) in lumbar puncture. Sassi (*Gl'Incurabili*, An. 14, F. 17 and 18, '99).

Attention drawn to the importance of obtaining a history of recent influenza before the administration of anesthetics, especially of chloroform; there have been large numbers of deaths from chloroform administration, and this is especially the case during influenza epidemics. Very suspicious cases have occurred, which were clearly explained by the depressed condition of the nervous system and of the heart. William Calwell (*Brit. Med. Jour.*, Sept. 29, 1900).

Surgical complications of influenza. Its toxic action is noted in the central and peripheral nervous system and the general condition. Its inflammatory effects are found upon all mucous membranes. Influenza bacilli enter the organism by all routes, reach the blood, and then become wide-spread. G. Perez (*Deutsche Zeit. f. Chir.*, Nov., 1902).

While the foregoing history and symptoms of influenza relate to its true epidemic prevalence, it is proper to state that sporadic cases, presenting all the more characteristic symptoms, are met with during every winter in the temperate zone, particularly during the first two or three days of high temperature following a week of intense cold.

Diagnosis.—The coincident development, without premonition, of general febrile symptoms, violent pains in the head, back, limbs, and various parts of the chest or abdomen, catarrhal irritation of the membranes of the respiratory passages or alimentary canal, or both, with mental and nervous depression, is so characteristic of this disease as to render the diagnosis easy.

[An ordinary attack of influenza lasts from three to ten days; of dengue, from one to three weeks. The former is marked by muscular debility; the latter, by intense articular pain, especially at the knees, occasioning a characteristic limping gait. Catarrhs of the various

mucous membranes constitute the rule in influenza, the exception in dengue. The latter presents a characteristic eruption. In influenza eruptions are rather exceptional, and, when present, variable. The temperature of dengue is apt to be remittent and higher than that of influenza. Convalescence from influenza is generally rapid; from dengue, slow and tedious.

For a few days influenza and typhoid fever might be confounded with one another. The former, however, does not present the dilated pupil so often seen in the latter, nor ever a rose rash; the temperature-curves of the two diseases are distinctly different, and the characteristic stool of typhoid fever is wanting in influenza. J. C. WILSON and S. SOLIS-COHEN, Assoc. Eds., Annual, '91.]

Peculiar vesicular eruption on the soft palate considered characteristic of influenza. The eruption consists of little vesicles resembling sago-grains, of from 0.5 to 1.0 millimetre in diameter. Shelly (Brit. Med. Jour., Apr. 15, '93).

Peculiarity of the tongue observed in cases of influenza, and which is believed to be characteristic. It consists in an appearance of porcelain-like whiteness, associated with humidity. The coloration is sometimes uniform, sometimes mottled. It makes its appearance within the first two or three days of the attack, and sometimes persists until the patient believes himself well. Faisans (Le Bull. Méd., May 28, '93).

Diagnosis of influenza during puerperal state. Marked and repeated chills; severe pain in the head, body, and extremities; gastric and pulmonary disturbances. Pain and soreness sufficiently characteristic to establish the differential diagnosis between it and puerperal fever. T. M. Burns (Annals of Gyn. and Ped., Sept., '95).

Attention drawn to a peculiar condition of the tongue noticed in cases of influenza: the appearance of dark, purplish-red spots scattered over the anterior half of the dorsum, about the size of a pin's head, becoming white and vesicular later on; the latter also noticed on the inside of the mouth and soft palate. John Terry (Lancet, Oct. 12, '95).

Symptoms of otitis of grippal origin:—

1. At the outset of the otitis phlyctenules filled with blood appear on the tympanic membrane, and sometimes cover it completely, but rarely appear on the walls of the auditory canal. When the phlyctenules break and blood oozes from them, the membrane itself is at first not yet broken through to give exit to pus from within the tympanum.

2. Perforation occurs through a kind of baggy prolapse of the tympanic membrane.

3. Tendency to early complications with processes rapidly destructive in the mastoid, acute caries and necrosis, thrombosis of sinuses, pyæmia. Osteitis may occur at the outset, developing quietly without accompanying signs of inflammation of the tympanic cavity, which may be invaded later.

4. Persistence of pains and buzzings of the ear, often more prolonged after the perforation than in non-grippal cases. The membrane once more healed and the scar closed by cicatrix, deafness may persist, though repair seems perfect.

These four characteristics, even in the absence of bacteriological confirmation, will establish the diagnosis from non-grippal otitis media. Loewenberg (Le Bull. Méd., Mar. 2, '98).

Eruptions of influenza most often observed to simulate those seen in scarlet fever, measles, and herpes: The measles eruption closely resembles the papular form, is mottled, or at times blotchy. It may be confined to the cheeks or it may cover the entire surface of the body. The herpetic eruption is frequently called urticaria, but it seems to be more properly called herpes. One of the personal cases had a typical herpes zoster, and infected two other children in the same family with a disseminated herpes. J. Edward Herman (N. Y. Med. Jour., Feb. 17, 1900).

The fact that many in the same community are attacked simultaneously or in quick succession renders the clinical diagnosis more complete; yet some of the first cases observed are generally denominated violent "colds," and when not

severe are treated with domestic remedies without the aid of a physician.

A pathognomonic sign of influenza: Congestion of the greater part of the whole of the faucial arch, including usually the uvula and the posterior part of the soft palate. The dilation of the smaller vessels of the mucous membrane is sometimes extreme, and not infrequently arborescent, but the distinguishing feature of influenza is a narrow painless patch of superficial ulceration on the edge of the anterior pillars on both sides, evidently due to desquamation of the epithelium. It is sometimes present long after the disease. F. Phillips (Brit. Med. Jour., Nov. 11, '99).

The diagnosis of influenza in children is easy during an epidemic, but not in its absence. The following symptoms are distinctive: 1. The presence of influenza bacilli of Pfeiffer in the expectoration. 2. The simultaneous development of respiratory, digestive, and, at times, nervous phenomena. 3. Early and pronounced prostration, incommensurate with the severity and duration of the attack. In addition to these differential points one must bear in mind the characteristic signs of all the other diseases resembling influenza, such as pneumonia, meningitis, gastro-enteritis, typhoid fever, scarlatina, measles, continued hyperpyrexia, and rheumatism. H. B. Sheffield (N. Y. Med. Jour., June 30, 1900).

The occurrence of various forms of catarrhal fever, which are often called grippé or influenza by physicians and laymen, is something altogether different. Sporadic cases of coryza and bronchial catarrh should never be mistaken for influenza, although the symptoms of influenza may be imitated in an exquisite manner. The celebrated Bonn professor's advice is that a complaint presenting catarrhal features should not be diagnosed as true influenza until the characteristic microbe has been found.

The most distinctive mark of typical severe influenza is its remarkably sudden onset, the only disease which resembles it in this respect being Asiatic cholera.

Some of the symptoms are: Headache of a particularly racking type, frontal or orbital, often the precursor of delirium; acute aches and pains in the back, not unlike those which are the forerunners of variola. The condition of the tongue is peculiar to the disease. According to Goodhart, it is generally tremulous, swollen, soft, and coated with a thick, creamy, dirty fur, accompanied usually by a particularly offensive smell of the breath. The sweat, also, has an odor peculiar to this disease alone. Sometimes the coryzal symptoms are severe to a degree, and sometimes a dry and hard cough is an accompaniment. The temperature varies very considerably, occasionally running to a high point, but often rising to no appreciable extent. Rigors and drenching sweats are a not uncommon feature in the course of the complaint. Goodhart rightly lays especial stress upon the value in diagnosis of an extensive diffusion over the bases of the lungs of characteristic sharp, sticky râles. Editorial (Med. Record, Jan. 19, 1901).

Influenza can be diagnosed with ease and certainty by observing the peculiarity of appearance of the velum palati. It precedes the initial chill and fever by some days, and it persists when convalescence is apparently ended.

The phenomenon in question is seen upon the mucous membrane of the soft palate in the form of small, convex projections of a pearly whiteness or transparency. Their size is that of a grain of sand. In number they are either few and confined to certain parts of the velum or its processes or else abundantly scattered over the whole of its anterior surface. The certain parts exquisitely displaying them in their circumscribed form are: (1) the base of the uvula; (2) the median raphe; (3) the lateral borders of the same; (4) the anterior surface of the palato-glossal fold about the upper border of the tonsil. A spatula rubbed over them gives a hard, rough sensation.

They are not distinguishable in obscure light, as in cloudy weather, nor discernible in any but a very bright artificial illumination, and are best seen in

the sunlight, direct or diffused. They must not be confounded with minute drops of mucus or saliva often present. Sometimes they are entirely obscured by a tenacious secretion covering the surface. The use of a handkerchief or the handle of a spoon to remove this gives the peculiar rough feel, and reveals the little projections on the mucous membrane.

The color of the field to these bodies is flesh red in the otherwise normal individual; angry red from the consumption of alcohol or use of smoking-tobacco; waxy white in the tuberculous and in those subject to other wasting diseases. Sometimes punctate hemorrhages complicate the picture, and in a single instance the color of the little enlargements was bright red.

Their existence is devoid of any subjective sensation. Louis Koplinski (Med. News, June 1, 1901).

Etiology.—At the present time a large majority of medical writers and teachers assume that influenza is an infectious disease, caused by a specific bacillus. And they generally point to the bacillus discovered in the pus-cells of the tracheal mucus by Pfeiffer in 1892, and in the blood by Canon the same year, as the essential cause of this disease. To the toxins developed by this micro-organism are also attributed the many and important complications and sequelæ that accompany or follow a large proportion of the attacks. As early as the middle of the present century it was suggested by Dr. J. K. Mitchell, of Philadelphia, that the disease was caused by minute cryptogamic bodies in the air. In 1868 Dr. J. N. Salisbury, of Cleveland, claimed to have discovered a species of infusorium in the nasal discharges of a considerable number of cases which he regarded as the essential cause of the disease. The extraordinary rapidity of the spread of the disease over whole continents led nearly all of the older writers to attribute

it to sudden and extreme changes in temperature, moisture, and electric conditions of the atmosphere, but no uniformity of such changes has been found in different epidemics.

In the district prison at Freiburg: Of 406 prisoners, 35 per cent. were stricken; of those in solitary confinement, 30 per cent.; of those in the common wards, 50 per cent.; of those in communication with the outer world, 70 per cent. The restriction of the outbreak to different corridors shows that it was not due to a miasmatic influence. Kirn (Aerztliche Mittheil. aus Baden, Karlsruhe, vol. xlv, No. 7, '90).

Influenza is a paresis, or partial paralysis, of the pneumogastric nerve, depending probably on such a sudden change in the atmosphere as involves an increased expenditure of force in maintaining circulation and respiration. The best remedies are strong excitomotor stimulants, chief among them strychnine, caffeine, alcohol, and ammonia. Morris (Jour. Amer. Med. Assoc., Jan. 3, '91).

Operation on the nose should not be performed during an epidemic of influenza, as operations usually cause a relapse, with marked depression. The wound invites infection. Delavan (N. Y. Med. Jour., June 8, '95).

There can be no influenza without Pfeiffer's bacillus. De Renzi (La Clin. Mod., Dec., '95).

The influenza bacillus is capable of giving rise to fibrous, serous, or even hemorrhagic, exudate in the lungs, which may become purulent. When the sinuses communicating with the nose are inflamed it is nearly always a result of infection with the influenza bacillus. Lindenthal (Wien. klin. Woch., Apr. 15, '97).

The influenza bacillus, 0.5-1 x 3 microns, reacts peculiarly to staining agents, the poles being deeply stained, with an unstained equator, thus causing a close resemblance to a diplococcus. It is readily stained with dilute carbol-fuchsin, or Löffler's blue solution. It is difficult of cultivation, but there can be no difficulty in detecting it on cover-slips of the catarrhal secretion. Eugene Wasdin (Penna. Med. Jour., Nov., '97).

Relative rarity of cases in which the influenza bacillus can now be demonstrated as compared to earlier epidemics. The diagnosis cannot be made to depend on the sputum examination, though the Pfeiffer bacillus should be carefully looked for. In the latest Freiburg epidemic the type of disease observed was chiefly pneumonic, the pure toxic, the gastro-intestinal, nervous, being absent. Clemens (*Münchener med. Woch.*, No. 27, 1900).

In the influenza cases with pneumonia observed in 1899 the influenza bacilli were found in very scanty numbers, and soon disappeared. Nevertheless severe toxic symptoms followed, the heart, muscles, and lungs being involved. In such cases partial immunity from previous infection probably exists. The germs develop, but break down rapidly.

Their toxic substances are thus set free, with dangerous results. Wassermann (*Deut. med. Woch.*, No. 28, 1900).

The bacillus of Pfeiffer found in 12.6 per cent. of the cases examined. The seasonal incidence of the disease shown, the majority of cases falling between the end of November and the end of April. Clemens (*Münchener med. Woch.*, July 3, 1900).

The following conditions tend to increase the prevalence of influenza: (1) abnormal increase in the barometric pressure and in the absolute range between the highest and lowest pressures for the epidemic months; (2) sudden frequent and extreme alterations of abnormally high and low temperature ranges; (3) comparatively lower relative humidity during the prevalence of sharply epidemic influenza; (4) diminished precipitation, but short periods of unusual foginess alternating with periods of dryness; (5) marked prevalence of strong northerly winds, frequently alternating with very calm weather; (6) predominance of relatively clear and sunshiny days during exacerbations of influenzal attack (these attacking periods having invariably been preceded by sudden thaws and relatively warm, damp, murky weather).

H. S. Anders (*Medical News*, Nov. 9, 1901).

Infection with influenza bacilli is prevalent apart from an epidemic of influenza. Influenza bacilli have been found in the sputa of fifty of one hundred unselected cases with cough. In about one-half of these sixty cases the influenza bacilli were in practically pure culture. There is nothing distinctive in the clinical manifestations of influenza apart from epidemics, and the diagnosis can with certainty be made only by the examination of the sputum for influenza bacilli. The duration of the cough and expectoration after an attack of acute influenza does not usually exceed six weeks, but in some cases the duration is for months or years. Many of the cases formerly classed as chronic bronchitis are chronic influenza. Cases of chronic influenza with paroxysmal dyspnoea may closely resemble asthma. Chronic influenza is not infrequently mistaken for pulmonary tuberculosis. F. T. Lord (*Boston Med. and Surg. Jour.*, Dec. 18, 1902).

Careful meteorological observations and records kept in Chicago during the prevalence of the epidemic of 1889-'90 showed the presence in the air of a decided excessive amount of both free and albuminoid ammonia, with almost entire absence of ozone. Whether such conditions of the atmosphere could foster the rapid evolution of the bacillus of Pfeiffer could be determined only by similar records kept through both epidemic and non-epidemic periods. That the disease is caused by some infectious or bacterial agent, capable of rapid development and wide diffusion in the air, is proved by the suddenness of its attack, the large number attacked at the same time in a community without any communication with each other, and its simultaneous outbreak in places widely separated from each other. Thus, in the last great epidemic, beginning in the autumn of 1889, it was recognized in St. Petersburg in

October, in Central Europe in November, and in England, Massachusetts, Connecticut, New York, Pennsylvania, Rhode Island, Ohio, Indiana, Illinois, Wisconsin, and Kansas during the last week of December, 1889 (see *Jour. Amer. Med. Assoc.*, volume xiv, pp. 817-822). To the same import is the fact that the passengers and crew on board of ships have been attacked on the ocean two weeks after any communication with the land. And also the fact that hermits and other persons in complete isolation have suffered severe attacks at the same time with those in the general community. The bacillus discovered by Pfeiffer, and claimed to be the essential cause of influenza, is very small, non-motile, and stains well with methylene-blue.

It is found in great numbers in the nasal and bronchial muco-purulent discharges during the active progress of the disease, and sometimes remains in those localities several weeks after the recovery of the patient. It has been found penetrating other tissues and in the blood, though much less abundantly, and on culture-media it is said to grow only in the presence of hæmoglobin.

Pathology.—Ordinary post-mortem examinations reveal no structural changes peculiar to this disease. There are congested and inflammatory conditions of the mucous membrane either of the respiratory passages or of the digestive organs, or both. In some cases such inflammations have extended into the frontal sinuses, the maxillary antrum, and to the middle ear, and in more cases there are evidences of pneumonia.

Hæmorrhagic otitis media described as characteristic of the epidemic. It sets in between the third and seventh day of the disease, and is attended with hæmorrhagic effusion into the tympanum, manifested by intense pain. Spontaneous perforation usually takes place in the course

of twelve hours. Haug (*Münch. Med. Woch.*, Jan. 21, '90).

One hundred cases of aural and cutaneous complications seen in epidemic of influenza. Although very painful, the patients spending sleepless days and nights from the agonizing pains shooting through the head and shoulders, the cases, as a rule, ended in complete recovery in a comparatively short time. Eitelberg (*Brit. Med. Jour.*, July 19, '90).

Ocular lesions seen in influenza are manifold, but, if any predilection is shown, it is for the optic nerve and retina, and for the various periorbital sinuses. In panophthalmitis enucleation should be deferred when the infection is from a general cause and the patient is in bad condition; but when the origin is local and the general condition is good it should be performed at once. Panas (*Revue Gén. de Clin. et de Thér. Jour. des Prat.*, Apr. 20, '95).

Eye complications following grip are comparatively rare. Grip may affect the eye by inflammatory process or by invasion of the accessory sinuses. It may affect the nervous tissues. The inflammatory affections involve especially the conjunctiva, the uveal tract, tissues of the orbit, and perhaps the fibrous capsule of Tenon. The nervous apparatus of the eye is especially liable to become involved by paresis of accommodation or of the extrinsic muscles of the cervical sympathetic, by papillitis and retrobulbar neuritis, and also anæsthesia of the cornea may occur. Pooley (*Amer. Jour. of Ophthal.*, May, '95).

The presence of the influenza bacillus exerts a very unfavorable influence on the bony structures of the ear, often converting apparently very simple cases of acute suppurative otitis into very malignant ones, with rapid destruction of bone, and this without marked symptoms. This tendency to rapid bone-destruction should be constantly kept in mind, and can be prevented only by early and, if necessary, repeated paracentesis. Wells P. Eagleton (*N. Y. Med. Jour.*, Aug. 7, '97).

Influenza is primarily a local parasitic disease of the mouth, throat, bronchial tubes, etc., the special nervous symptoms

being due to absorption of the toxin secreted by Pfeiffer's bacillus. This toxin exerts a selective affinity for different parts of the nervous centres, with a strong tendency to largely affect the medulla oblongata. In the spinal cord the sensory appear to be more affected than the motor portions, shown by the numerous special painful affections seen in cases of the disease. The so-called incubation-period, of hours or two or three days, is that in which the first portion of this toxin is formed, and this often takes place before any sensation of illness is felt. The effect upon the nervous tissue unquestionably varies from mere poisonous irritation to actual inflammation, and the seriousness of the effects will vary with this. One of the best proofs of the special involvement of the bulb and the eighth nerve is the marked influence exerted upon the heart, as shown by the marked and often fatal asthenia observed in acute cases; also by the tachycardia and bradycardia seen in connection with the influenzal disease. Peter Eade (*Brit. Med. Jour.*, Sept. 29, 1900).

But all these are regarded rather as complications than as essential features of the general disease. The general febrile symptoms appear to result from the direct action of the bacillus or its ptomaines on the corpuscular elements of the blood and of the cerebral-nerve centre, creating great pain and soreness, with marked depression and impairment of vital resistance. This view is sustained by A. Cantani, Jr., who injected cultures of the influenza bacillus into the brain of rabbits, by which severe nervous symptoms were produced, and from which he inferred the bacillus to be an intracellular poison acting primarily on the central system.

Effect of intracranial inoculation of the influenza bacillus in rabbits studied. Virulent cultures were introduced into the brain by trephining. Severe nervous symptoms, high temperature, and death followed in about twenty-four hours. At the autopsy at the site of the wound

was an oedema containing numerous influenza bacilli and hæmorrhages. The meninges were hyperæmic and infiltrated with hæmorrhagic exudation. The brain was markedly hyperæmic, the ventricles often containing a purulent exudation in which numerous influenza bacilli were found. The substance of the brain, on section, showed many small hæmorrhages and numerous bacilli, with polynuclear leucocytes. The bacilli appeared to spread, especially by the lymph-channels. The spinal cord was also invaded to a slight extent, the bacilli passing by the way of the central canal. The processes were generally those of a myelitis, similar to the encephalitis of the brain, but not nearly so severe. The other lesions present were bloody, serous exudate in the peritoneal cavity, acute congestion of the spleen, hyperæmia of the kidney, small hæmorrhages into the suprarenal bodies, and incipient fatty degeneration of the liver. The lungs were injected. Practically the same results could be obtained by inserting a few milligrammes of the dead growth of the bacilli (killed by heat) beneath the dura mater. This proves that the toxins are the really active hurtful agents. Cantani (*Zeit. f. Hyg. u. Infect.*, B. 13, '96).

Three cases of influenza which terminated fatally, in which the presence of Pfeiffer's bacilli in the nervous centres was ascertained. A. Pfuhl (*Zeits. f. Hyg. u. Infect.*, p. 112, '97).

We are justified in assuming two forms of heart dilatation in influenza: One presumably produced by the action of the toxin upon the nervous system of the heart and possibly upon the myocardium; the second form occurring in such conditions in which outflow of the blood is materially interfered with on account of mechanical conditions.

The first form, according to the excellent observations made by West, undoubtedly may end fatally, although this has not been the case in the writer's experience. The second form is one that lasts much longer than the first, but in children has a tendency to recovery. F. Forchheimer (*Jacobi Festschrift*, p. 127, 1900).

Although albuminuria is fairly fre-

quent with influenza, nephritis is a rare complication. The nephritis complicating influenza is clinically of the acute hemorrhagic type and morphologically shows toxic lesions. It apparently attacks children more often than adults. The kidney disturbance may appear a few days after the acute symptoms of the influenza, or as long as a month later. The prognosis is favorable. Rowland G. Freeman (*Archives of Pediatrics*, Oct., 1900).

In the study of streptococcic bronchitis in influenza in 24 males and 30 females the symptoms were as follow: The onset of the disease always follows an attack of influenza, the primary attack being, in the majority of cases, of the respiratory type; in the minority, of the nervous or gastro-intestinal form. The symptoms of influenza disappear before the attack of bronchitis develops. Exceptions to this rule occasionally occur. If the patient be in the period of convalescence from influenza the symptoms of that period will persist. The attack begins rather suddenly; so that in the most common form it will be fully developed in from twenty-four to forty-eight hours. The dominant symptom is the cough; always spasmodic, sometimes simulating whooping-cough, occurring at night as well as in the day-time, and annoying the patient exceedingly. On account of the violence of the cough the patient complains of headache, pain in the lower region of the thorax, and sometimes in the abdominal muscles. For the same reason vomiting occurs, and not infrequently the appearance of the face is the same as in whooping-cough. The attack of coughing is usually followed by expectoration, the sputum varying from mere serous through the various grades of mucous and purulent. The amount of coughing is disproportionate to the quantity of expectoration; so that in 10 of the cases there was an admixture of blood; in 6 of these there was bloody mucus, in 4 unmixed pure blood,—in 2 of the latter apparently independent of the effort of coughing.

Physical examination shows evidences of bilateral bronchitis in the medium-sized tubes, in the moist stage. At

times there are evidences of bronchitis of the larger tubes. The larynx is not implicated in the majority of cases; when the trachea can be seen it is not uncommon to find its mucous membrane injected. With these symptoms there is present an abnormality in body-temperature. It may be as low as 96° F. in the morning, and an evening temperature of from 99° to 100° F. or more (registered under the tongue or in the rectum). The pulse may be abnormally slow, normal, or rapid. The length of the attack varies. With proper treatment, begun at the proper time, the average duration commonly will not exceed two weeks. F. Forchheimer (*Med. News*, June 1, 1901).

Abductor laryngeal paralysis frequently presents great difficulty as regards determining the etiology; but a number of cases have been observed in which a paralysis of one cord, lasting sometimes for years, was undoubtedly due to a post-influenzal neuritis. St. Clair Thomson (*Brit. Med. Jour.*, Sept. 29, 1901).

Symbiosis with certain invisible bacilli may be an important factor in prolonging the life of the bacillus of influenza. The writer has been able to cultivate influenza bacilli through some twenty generations, which were derived from a case of measles conjunctivitis and were associated with xerosis bacilli. In every case the influenza bacilli died out unless this symbiosis with the xerosis bacillus was kept up. It is suggested that the latter may have modified the agar-agar, which was the medium used, in such a way that it was rendered more favorable for the growth of the influenza bacillus. The writer also found that the diphtheria bacillus also served as a feeder for the bacillus of influenza, but not so successfully as the xerosis bacillus. M. Neiser (*Deut. med. Woch.*, No. 26, 1903).

Prognosis.—The mortality from uncomplicated cases of influenza is very small, probably not exceeding 0.25 of 1 per cent. While this is true, it is equally true that during the prevalence of an influenza epidemic the mortality from

tuberculosis, pneumonia, bronchitis, and typhoid fever is greatly increased.

[Of 528 deaths attributed to influenza, 46 resulted from the uncomplicated disease, 39 from senility, 49 from phthisis, 273 from croupous and broncho-pneumonia, 81 from other affections of the lungs, 5 from pleurisy, and 2 from empyema. Thirty-three deaths were noted from cerebral affections in the course of influenza. AXEL ULRIK, *Corr. Ed.*, *Annual*, '91.]

During the three months—January, February, and March, 1890—constituting the period of active prevalence of the epidemic for that year the number of deaths reported to the Register of Vital Statistics of Chicago, from the four diseases just named, were nearly 100 per cent. greater than during the corresponding months of the preceding year. The effect in diminishing the normal vital resistance is longer manifest in regard to typhoid fever and tuberculosis than in any other general diseases. One attack affords no immunity to subsequent attacks of the influenza, and there are no known prophylactic measures of value.

The rate of relapse in influenza is not less than 10 per cent. A previous attack rather predisposes than immunizes, and, if protection be afforded, it is so short as to be clinically negligible. Turney (*Lancet*, Feb. 5, '98).

Prevention of influenza possible by the constant daily use of a 1 in 200 to 1 in 300 carbolic solution as a mouth-and-nose wash. From a teaspoonful to a tablespoonful, according to the sensitiveness of the mucous membrane, in a large tumbler of water, as hot as can be borne, should be used for repeated gargling, rinsing out of the mouth, and sniffing up the nose. Laborde (*Bull. de l'Acad. de Méd.*, Feb. 27, 1900).

Treatment.—The discovery of the bacillus by Pfeiffer as the supposed specific cause of influenza has not been followed by the discovery of a special remedy, either for its destruction or for

reliably counteracting its effects upon the human system. Consequently we must be guided in our choice of remedies by the prominent functional disturbances presented in each case. These are generally diminished eliminations from the skin and kidneys; congestion of the mucous membranes, especially of the nasal and respiratory passages; and severe pains and soreness throughout the nervous and muscular structures of the body. To allay the pains and soreness and restore more active eliminations from the skin, kidneys, and intestines are the rational indications to guide us in the choice of remedies. If called in the early stage of the disease, in all the milder cases a single powder—containing from 15 to 8 grains of Dover's powder, 3 grains of calomel, and 3 grains of pulverized gum-camphor—given at bedtime and followed in the morning by a saline laxative sufficient to produce two or three intestinal evacuations has very generally relieved all the more important symptoms; and by giving 3 grains of quinine sulphate three times a day for three or four days the convalescence has been complete.

At the outset of an epidemic every member of his battalion given $4\frac{1}{2}$ grains of sulphate of quinine daily, and manœuvres in the open air forbidden. This was continued for twelve days. While the epidemic spread in the immediate vicinity of the barracks, few of the soldiers were affected. Similar good results, however, were not had when the disease already existed. Then antipyrene rendered the greatest service. Tranjen (*Berl. klin. Woch.*, Feb. 17, '90).

Sulphate of quinine strongly recommended in the treatment of influenza. Large doses should be administered in accordance with the age and temperament of the patient and the severity of the attack. Gellé (*Jour. de Méd. de Bordeaux*, Mar. 9, '90).

Best results obtained from diaphoresis

followed by quinine. Combination of pilocarpine and morphine found to act better than antipyrine:—

R. Pilocarpine hydrochlorate, $\frac{1}{2}$ grain.

Morphine sulphate, $\frac{1}{8}$ grain.

Water, 3 ounces.

M. Sig.: A teaspoonful every fifteen minutes, by mouth. Wood (University Med. Mag., Mar., '90).

Quinine not completely excreted from tissues for some days; 3 to 5 grains in an effervescing saline draught every three or four hours controls the course of influenza. Large doses unnecessary; they produce marked cardiac depression, particularly in elderly people. Marsh (Lancet, Mar. 9, '95).

Quinine an almost unexceptionable preventive of influenza; 5 grains immediately after breakfast during prevalence of epidemic. Sinclair Coghill (Brit. Med. Jour., Apr. 6, '95).

Treatment is mostly symptomatic. In the beginning calomel in doses of from 2 to 5 grains for adults (one-tenth that amount for children) should be given. The calomel is divided into three powders, given at intervals of an hour. As long as the fever lasts, rest and a fever diet are indicated. Salipyrin, 15 grains every evening, and in the morning half that amount, to be given. With this remedy almost phenomenal results are obtained. Salipyrin must be continued for some time in order to achieve a good result. Ten grains prescribed at night for from three to five days after the fever has disappeared. Even after the temperature has fallen to the normal the patient should be confined to his room for a number of days. Bekess (Wiener med. Presse, Aug. 15, '97).

Calomel is an exceedingly useful drug in the early stages of an attack of influenza. The dose to be given amounts to 2 grains twice a day to adults, or 1 grain three or four times a day. In infants smaller doses are given, according to age. Cure can usually be produced by the third day. Frudenthal (Therap. Monat., Oct., '97).

The pressing indication to be met in asthenic patients lies in the state of their forces, which need sustenance. Stimulating remedies should occupy the first

place. Thus, alcoholic liquors, diffusible stimulants, and tonics should be made the basis of medication. The salts of quinine, selected and administered with judgment, will not only control many of the pains of the disease, but will relieve the weakness and stimulate the patient. Landouzy (La Presse Méd., Jan. 29, '98).

In children a purgative dose of calomel should be given. The patient should be kept in bed, the temperature of the room at 70° F. or more at first, the diet should be scanty and fluid at first: milk, cereals, farinacea, water, lemonades, and broths. The further development of the case will gradually indicate eggs, and perhaps—in a few selected instances only—alcohol in addition to other medicinal stimulants.

If there be a high temperature, cold water is not indicated either as a bath or as a pack. The irritating cough which often requires opiates is rather increased than soothed by it; the characteristic bronchitis of influenza does not bear it; the frequent copious perspiration contra-indicates it, and so does a weak heart under all circumstances. When there is much muscular pain and restlessness, a warm bath is often beneficial. Hot baths should be avoided unless a very short one in an occasional collapse. While many common cases of pneumonia, with fair circulation, are apt to do well with cold packs, influenza-pneumonias do better with warm ones.

According to Ditmar Finkler, of Bonn, quinine occupies a front rank. In the German collective investigation reports some praised quinine as giving brilliant results, while others were greatly disappointed in its effects.

Whenever vomiting is severe, temporary abstinence and afterward rectal alimentation find their indication. Alcohol greatly diluted, peptones, mild salt solutions, and liquid albumins are readily absorbed in the colon, which, even in the smallest infant, is made accessible by elevating the hip and moderating the current by not raising the irrigator more than a foot above the anus. Peptonized milk, egg, and broths are absorbed in part. In severe vomiting best relief is given by morphine, rarely by ice, either internally or externally. A tablet of 1

milligramme may be thrown into the mouth of a child of two or four years, there to be absorbed, or $\frac{1}{2}$ or 1 drop of Magendie's solution may be administered in the same manner without dilution.

One of the best stimulants, useful in the gravest of all cases which are attended with collapse and heart-failure, is Siberian musk. A child of two years should take of the 10-per-cent. tincture 5 to 10 minims every half-hour until half a dozen or a dozen doses have been taken. Musk, together with large, hot enemata, will lead over many a difficult pass. A. Jacobi (*Med. News*, Dec. 15, 1900).

Quinine in small doses is a sure prophylactic against influenza. Personally very subject to it, having had five attacks in four years. When the next epidemic occurred, the writer began to take 2 grains (0.13 gramme) of quinine every morning with his breakfast, and has done so each succeeding period when the disease was prevalent. As a result, he has never had another attack. He obtained the same favorable results in his patients who had on previous occasions suffered with influenza. The quinine acted as an effectual prophylactic. W. Habgood (*Brit. Med. Jour.*, June 8, 1901).

Hypodermoclysis is of great value in influenza. Case reported in detail in which the results were surprising. The patient a woman of 45. When first seen the pulse was 142 and threadlike; there was great weakness, dyspnoea, progressing to collapse; constant vomiting and subnormal temperature for three days, notwithstanding the most energetic measures, caffeine, etc. As a last resort, the patient being almost in articulo mortis, 100 grammes ($3\frac{1}{2}$ ounces) of salt solution was injected subcutaneously. The benefit was apparent in half an hour, and all the symptoms rapidly improved. There was a chill and slight fever during the evening, but by the next morning the pulse was 80 and strong, temperature nearly normal, and in three days the patient was completely cured. E. Cioffi (*Gazz. d. Ospedali*; *Merck's Archives*, Feb., 1904).

In the more severe cases, instead of one

powder at bed-time, the same should be given every four hours until four have been taken, then move the bowels with the laxative and follow with moderate doses of quinine, alternated with 5-grain doses of sodium salicylate, until all the active symptoms have disappeared. When the bronchial symptoms have been persistent, with soreness in the chest, instead of the sodium salicylate I have given, with very good results, a teaspoonful of the following mixture every four or six hours until the chest symptoms were relieved:—

R Hydrochlorate of ammonia, $3\frac{1}{2}$ drachms.

Ant. et potass. tart., 2 grains.

Mercuric bichloride, 2 grains.

Morph. sulph., 3 grains.

Syr. of licorice, 5 ounces.—M.

When the influenza has induced at the beginning so much irritation of the gastric and intestinal mucous membrane that the powders of Dover's powder and camphor cannot be retained, I have given instead $4\frac{1}{2}$ -grain doses of salol aided by $1\frac{1}{2}$ or 3 grains of calomel at night for the first two days with entirely satisfactory results. Then smaller doses of the salol, alternated with very moderate doses of quinine, has been all the medication necessary to complete the recovery of the patient. In all cases, during the active stage the patient has been kept at rest, and, as far as practicable, in a well-ventilated, warm, but not overheated room.

Salicin, 20 to 40 grains prescribed every hour, for three or six hours; then, every two hours, for a day; after that, at long intervals. Convalescence commenced in twenty-four hours in all cases, and, in most, in twelve hours. There were no serious complications. MacLagen (*Lancet*, Jan. 11, '90).

In the exudative form of aural complications, when the pain is severe, local blood-letting in the temporal region, ice-

bags behind or about the ear, and, in some cases, iodine locally to the mastoid, forms the treatment. Subsequently, if paracentesis cannot be performed, warm instillations into the external auditory canal to be made hourly. If the pain increases and the temperature rises while exudation is detected in the middle ear, with pain and sensitiveness in the mastoid region, paracentesis affords the greatest relief. Inflation to be practiced, the canal syringed with an antiseptic solution and packed with gauze. Haug (Münch. med. Woch., Feb. 25, '90).

Faradic brush recommended in treatment of the neuralgias of influenza. The painful nerve is included between the two buttons of a brush especially constructed for the purpose, or between two ordinary wire brushes, kept stable, and a faradic current, at first weak, but gradually increased in intensity. The application lasts from half a minute to two minutes. From eight to thirty *stances* are necessary. Nothnagel (Zeit. f. klin. Med., vol. xvii, Nos. 3, 4, '90).

Rapid relief obtained from the headache and the general nervous and digestive symptoms from the employment of copper arsenic in doses of $\frac{1}{100}$ grain. Johnson (Med. Summary, June, '91).

Administration of large doses of salicin, 20 grains every hour, advocated. Turner (Lancet, July 18, '91).

Twenty cases of influenza attended with neuralgic pains greatly ameliorated by 15 to 30 grains of salophen. Recovery within two days. Salophen embodies advantages of salicylate of soda without possessing its disadvantages. Claus (Med. Bull., May, '95).

Of all antineuralgic remedies tried, salophen proved the most useful. Separates into salicylate of soda and acetylparamidophenol in alkaline contents of the small intestine; odorless and tasteless. Hennig (Münch. med. Woch., Sept. 3, '95).

Salicylate of soda, 2 or 3 grains every three hours to older children. Maltine with coca-wine for neurasthenic conditions. W. L. Stowell (Arch. of Ped., Oct., '95).

No drug has given more favorable results in the treatment of influenza than

benzoate of soda. It may be given in capsule or powder form, the usual dose being 10 grains, three or four times a day. When muscular symptoms are pronounced, the following combination acts admirably:—

R Sodii benzoas, 2 drachms.

Salol, 1 drachm.

Phenacetin, 36 grains.

M. et ft. chart No. xij.

Sig.: One powder every four hours. Editorial (Amer. Med.-Surg. Bull., Nov. 25, '97).

The pharyngitis and rhinitis, which are often the most troublesome symptoms of influenza in childhood, are treated by pulverizations. For this purpose a 2-per cent. alcoholic solution of rectified turpentine is preferred. Furst (Rev. Mens. des Mal. de l'Enfance, Jan., '98).

For influenza in children salipyrin is an efficient remedy. For a child of five years the dose is 4 grains, and for one of ten years 8 grains, to be administered three times daily. Editorial (Med. News, Mar. 19, '98).

Yerba santa prescribed in cases of cough supervening on influenza, with good results. Dose of fluid extract, 10 to 40 minims, combined with extract of malt, as malto-verbine,—dose, 1 to 4 drachms. Joseph Westmorland (Lancet, Apr. 23, '98).

In influenza potassium bicarbonate is a remedy of unusual value. Thirty grains of potassium bicarbonate should be given in a cup of milk every four hours during the day, and no other diet for 48 hours. This will, in most instances, quickly start the patient along to health. When milk is not well borne or readily taken, the remedy may be administered with a glass of cold water, only liquid diet being allowed from thirty-six to forty-eight hours.

Nothing seems to assist the action of potassium bicarbonate so well as a cathartic, such as calomel, podophyllum, etc. Stephen Harnsberger (Phila. Med. Jour., Nov. 10, 1900).

In only a very few instances has the fever temperature reached 104° F., and when it did it was readily reduced by free sponging of the surface or a few

doses of aconite or veratrum viride. The diet should be light and carefully adjusted to the ability of the digestive organs to receive and appropriate it. When pneumonia or any other complicating disease supervenes, for which the practitioner should always be on the alert, it should be treated promptly and on the same principles as would govern its treatment under other circumstances.

In multiple neuritis following influenza treatment should consist first in absolute rest in bed. Anodynes must be given in sufficient doses to relieve pain, when that is a prominent symptom. The antipyretic anodynes are insufficient in safe doses if the patient has pains for many days. Cinchonidine salicylate is distinctly valuable. At a later stage potassium iodide and mercuric chloride in small doses are helpful. When the pain is seated in an extremity, firm pressure with a flannel bandage yields great comfort. Blisters over the painful nerve-trunks when they are superficial are also valuable in relieving pain. Close watch must be kept on the action of the heart and the character of the breathing. In most of the fatal cases death results through paralysis of the diaphragm. The closest attention must be given throughout the course of the case to the nutrition of the patient and to the condition of the skin, especially over portions of the body exposed to pressure. As far as possible the stomach should be reserved for food. Allyn (*Jour. Amer. Med. Assoc.*, July 24, '97).

A soldier was brought to the hospital suffering with severe influenza, which commenced with a violent chill and pain in the side. Bacteriological examination of the sputum showed the presence of numerous streptococci. Marmorek's serum injected—20 cubic centimetres (5 drachms) each time—and after four injections the temperature was reduced to normal. The patient recovered completely. Carrieu and Pelan (*La Méd. Mod.*, Apr. 27, '98).

The foregoing outline of treatment of influenza is the result of my own observations during all the epidemics that

have prevailed in this country since 1837. The only cases of threatened "heart-failure" that have been met with were in patients who were habitual drinkers of alcoholic liquors or had taken large doses of some one of the coal-tar antipyretics with brandy or whisky.

Subcutaneous injections of pilocarpine followed by excellent results. Pyrexia may be met by cold sponging, cold affusions, the cold pack, or the cold bath. Antipyrine, antifebrin, and kindred remedies largely used during epidemic, and rendered excellent service. Eichhorst (*Corres. f. Schweizer Aerzte*, Mar. 1, '90).

In the painful form of influenza antipyrine and exalgin hold the first place. These failing, injections of morphine may be made. In the gastro-intestinal form, absolute rest in the recumbent posture should be maintained, and preparations of opium, of which paregoric is the best, administered. In the catarrhal form, quinine, 4 grains, morning and evening, should be given, alone or combined with antipyrine, 15 grains. Aconite is also useful in this variety. Stimulants may be required. Pulmonary complications call for cardiac tonic treatment:—

R. Caffeinæ,
Sodii benzoatis, of each, 30 grains.
Aquæ bullientis, 1½ drachms.

M. Sig.: Fifteen minims b. vel t. d., subcutaneously.

The depression following the acute attack of the disease is, in part, attributed to the administration of large doses of antipyrine, phenacetin, and antifebrin. Patton (*Med. and Surg. Rep.*, May 23, '91).

Phenacetin recommended in influenza in small and frequent doses. The drug does not cause gastric disturbances, it is prompt and decided in its action, it has no cumulative effects, and it is much safer for children and old people than is opium. P. O. Stimson (*Med. and Surg. Rep.*, Nov. 21, '91).

Protests against reckless use of such drugs as salicin and antipyrine; relieve immediate symptoms, but tedious con-

valescence and cardiac debility encouraged. Quinine the true antitoxic in influenza. Burney Yeo (Lancet, Mar. 2, '95).

Diminished mortality and shortened period of convalescence of recent epidemics of influenza due to the fact that antipyrene and similar depressants are being withheld. Grant (Lancet, Mar. 2, '95).

Concurrence with Burney Yeo and Mofatt, but patient should be alleviated by active measures. To do this and lower the temperature in influenza, 4- to 6-grain hourly doses (in cachets) of phenacetin valuable. Two more cachets at intervals of four hours, if necessary. J. H. Barnard (Lancet, Mar. 23, '95).

Phenacetin considered the safest and best remedy in influenza in the infant. As high as 5 grains at a dose has been given an infant eighteen months of age, with no depression. It was used in this case on account of a threatened convulsion, which passed away, and the child quieted down and went to sleep. Generally from $\frac{1}{2}$ to 2 grains should be given to children, with careful directions when to stop it. B. M. Smith (Ped., July 15, '97).

Salipyrin looked upon as almost a specific in influenza in childhood. At ages from five to ten years $4\frac{1}{2}$ grains are given thrice a day; from ten to fourteen years, 15 grains thrice a day. After a couple of days it will usually be sufficient to give only two doses a day. Furst (Rev. Mens. des Mal. de l'Enfance, Jan., '98).

Cinnamon in strong decoction or in tabloids when administered within twenty-four hours of the onset of the attack shortens it and often leads to rapid convalescence. Ross (Brit. Med. Jour., Mar. 18, '99).

Some of these have required the diligent and protracted use of strychnine, strophanthin, and other vasomotor tonics, with rest and fresh air, to secure a return to health.

In the treatment of the cardiac complications of influenza alcohol is of the first importance in cases of simple heart-failure. Caffeine citrate and cactus grandi-

flora proved next in value. Nitroglycerin appeared to act well in the aged and in gouty cases at any period of life, and strychnine was also of great service. Curtin and Watson (Inter. Med. Jour., Jan., '93).

Convalescence following influenza: Glycerophosphates of lime, iron, sodium, magnesium, and potassium, either by subcutaneous injection or by the mouth. Albert Robin (Bull. Gén. de Thé., May 15, 30, '95).

Strychnine arsenate or strychnine sulphate ($\frac{1}{125}$ grain) every hour or two, not more than eight or ten doses being given daily, admirably supports the nervous system, and therefore the heart. Editorial (Indian Lancet, May 16, '97).

Gelsemium given in nearly every case, and when given early the results were uniformly successful and no pneumonic symptoms developed. In several cases of sudden onset, with physical signs of the first stages of pneumonia, rusty sputum, etc., all symptoms disappeared within forty-eight hours after treatment with gelsemium was begun. To adults $1\frac{1}{2}$ or 2 drops of the fluid extract given every half-hour until the physiological effects of the drug are noted. Boise (N. Y. Med. Jour., June 17, '99).

Attention called to subnormal temperature and reduced pulse-rate which characterize the nervous depression following influenza. Strychnine sulphate, $\frac{1}{100}$ grain three times daily, with brandy in $\frac{1}{2}$ -ounce doses four or five times a day, recommended. Entire rest seemed to greatly assist recovery. B. J. Byrne (Jour. Amer. Med. Assoc., Mar. 10, 1900).

No specific for the malady is known, and the majority of physicians the world over appear to have come to the conclusion that each individual case should be treated on its merits, and that therapeutic remedies for influenza, *per se*, have but slight curative effects.

The German committee, which was formed after the epidemic of 1892, after obtaining the opinions of six thousand physicians in that country, stated in a general way that the use of drugs has been overdone in the treatment of influenza, and that a doctor's intelligent advice was of infinitely more benefit than

quantities of medicine. Rest in bed, the shunning of drastic agents, and, above all, curbing the desire to leave the sick-room until the seeds of the disease are entirely eliminated from the system are the only rational procedures. One great precaution to be observed in the treatment of influenza—as, indeed, in the treatment of all contagious diseases—is the thorough ventilation of the sick-room and of houses in which cases occur. Editorial (Med. Record, Jan. 19, 1901).

With reference to treatment, there seems to be nothing new, and nothing very effective. There is no specific for grippé, and until there is a protective or a curative serum there probably will be none. Editorial (Phila. Med. Jour., Jan. 19, 1901).

For the relief of the general aching which occurs at the beginning of infectious diseases aconite is the best drug. After aconite the drug that gives most relief is Dover's powder. With these should be combined some one of the coal-tar analgesics, and phenacetin has proved the most useful. A good prescription is the following:—

R Aconite, solid extract, 1 to 6 grains.
Dover's powder, 1 grain.
Phenacetin, 8 grains.
Quinine, 6 grains.

This is sufficient for two pills. Of these pills, six should be taken the first day and each succeeding day until the fever subsides. Then three should be taken each day, until all the catarrhal symptoms have disappeared.

It is a characteristic of grippé to produce painful affections of the accessory sinuses, and the supra-orbital pain which results from this is often almost unbearable. The best remedy for these is a drachm of ergot given every three hours in combination with a drachm of cinchona. Ergot is the ideal remedy for periodical neuralgias. When quinine and Warburg's tincture have failed to give relief it often proves of immediate service.

For the prostration which so often accompanies grippé, fluid extract of coca with nux vomica constitutes the best

remedy. W. H. Thomson (Med. News, Feb. 23, 1901).

NATHAN S. DAVIS (Chicago) and
CENTRAL STAFF (Philadelphia).

INGROWING TOE-NAIL. See NAILS, DISEASES OF.

INSANITY.

Definition.—Insanity means disordered mental function.

All disordered mental function is, however, not insanity; for example, the delirium of fever, of alcoholic or drug intoxication, although disordered mental function, is not, strictly speaking, insanity; still, the physical disorder upon which the febrile or toxic delirium depends does not differ so much from the underlying physical condition of insanity as may at first thought appear. The disorder of function in all cases is primarily due to a derangement of nutrition in the brain. This brings us to the fundamental fact that in order to have disordered function of the brain we must have either disordered nutrition or structural alteration of this organ.

At the present day this apparently materialistic conception must be accepted. As no mental or psychical manifestations can occur except through the medium of the brain, we may say outright that the brain is the organ of the mind, and any alteration in the structure or nutrition of the brain will affect favorably or unfavorably the functions of that organ. Upon this basis we may assume that without brain there can be no thought; and without healthy brain there can be no healthy thought.

The morbid physical basis of insanity is disordered nutrition of the brain in differing stages. It may be:—

1. Anæmia.
2. Hyperæmia.

3. Inflammation of the brain or meninges.

4. Toxic substances circulating in the blood (drug or bacterial poisons).

5. Gross lesions of brain-structure, such as tumors, apoplexies, abscesses, embolism with consecutive softening. These may be results of nutritive disturbances.

6. Interstitial hyperplasia of connective tissue, which is probably primarily inflammatory.

7. Primary structural alteration, hereditary or acquired.

Insanity must be conceived as a physical disease,—a disease of the brain. While it is customary to speak of mental disease, or of a psychosis, it is well understood that a disorder of the mind—or psyche—having no relation to a physical substratum, the brain, is impossible.

Classification.—Basing mental disease upon these physical substrata, the usual symptomatic classification of insanity into mania, melancholia, and dementia appears about as rational as a division of kidney diseases into polyuria, anuria, and incontinence.

The first requisite for a logical study of insanity is, therefore, a rational classification,—one based upon the known pathology or pathogeny of the disease. The time for a perfect classification of this sort has not yet arrived; our knowledge is still too vague or incomplete; but in the following an attempt has been made which may have some merits as a working scheme.

In this classification there are seven classes or groups of mental disturbance, most of them clearly differentiated clinically, but all based upon pathology or pathogeny.

The groups are as follow:—

I. Psychoses due to imperfect development of the brain, which may be heredi-

tary, congenital, or acquired. To this group belong idiocy and imbecility.

II. Psychoses due to vicious or abnormal brain-organization. These are always hereditary. To this group belong paranoia, circular and recurrent insanity. Some cases of hysteria and epilepsy may also be included.

Causes of insanity investigated in the last 1014 patients admitted to the Bristol Lunatic Asylum, 507 being males and a like number females.

From the statistics obtained it would appear that all forms of insanity are strongly hereditary, the percentage being for all cases with a definite history of hereditary predisposition 28.7 per cent., and with a strongly neurotic history 4.1 per cent.: total, 32.8 per cent.

That of all forms the congenital hold the first place with 44.4 per cent. Puerperal insanity seems to be the next most hereditary form, with 33.3 per cent. hereditary predisposition, and 7 per cent. with neurotic history, these percentages having regard to female cases only. Then follow the ordinary cases, with 29.7 hereditarily predisposed and 4.9 with a history of neurosis; 23 per cent. in general paralysis, 21.5 per cent. in epilepsy. J. R. Blachford (*Jour. of Mental Science*, July, '98).

When mental disease develops subsequent to an operation, the patients often show a strong hereditary tendency to insanity, the result of insane, intemperate, or neurotic ancestry. This is especially true in relapsing or circular insanity. H. M. Hurd (*Amer. Jour. of Obstet.*, Mar., '99).

Two cases of dementia in twins aged 33 years. This illustrates the fact that nervous systems and brains which have the same physical construction will act in the same way under given pathological conditions. Heredity in psychical affections is particularly well shown in many cases of insanity in twins. S. Souchanoff (*Klinitchesky Jour.*, Apr., 1900).

The simulated paranoia of chronic alcoholism belongs to a different group (Group VI).

III. Psychoses due to simple disturbance of nutrition in the brain, such as anæmia and hyperæmia. To this group belong the majority of cases of melancholia (depression) and mania (exaltation). In many cases the diagnosis "melancholia" and "mania" are incorrect, a transitory depression or exaltation being regarded as the essential clinical manifestation.

IV. Psychoses due to microscopical structural alterations in the brain. These are primarily probably nutritional or toxic.

In this class are included general paresis, catatonia, consecutive dementia, senile dementia, and epileptic dementia.

In a majority of the brains of those dying insane, macroscopical examination shows a milky opacity of the arachnoid, closely associated with underlying morbid processes in a space which can be covered with the two hands placed together, the lower ends of the hypothalamic eminences covering the spot where the fissures of Rolando meet. The giant pyramids are the first to show markedly-altered structure. J. B. Tuke (*Edinburgh Med. Jour.*, Feb. to June, '94).

The doctrine of the neuron and the interrelation of neurons within the central nervous system affords a foundation for possibilities in nerve-activity. The cortical areas are themselves complex structures, yet in each cluster the individual neuron preserves not only its integrity as distinct from other neurons, but also its threefold character as a nutritive and dynamic doubly-connected apparatus. The human brain shows four layers: (1) the molecular layer; (2) the ambiguous layer; (3) long pyramidal layer; (4) mixed pyramidal or polymorphic layer, including Meynert's layer, *plus* spindle layers. Alteration and destruction of fine naked collaterals and nerve-terminals shown to exist in the molecular layer and swelling and softening of minute protoplasm-granules attached to special processes in the superficial layer of the cortex. Lloyd Andriezen (*Brain*, P. 68, p. 549, '95).

Changes as given by Lloyd Andriezen explain the diminished sensitiveness of an alcoholic subject to impressions from without, and also the general loss of memory and lack of association of ideas. Microscopical examination cannot give us all the information we desire when the initial cause is not known. The conviction is steadily growing that actual agents which produce tissue-changes are chemico-toxic, absorbed or ingested, produced by altered tissue-metabolism or elaborated by bacteria. Dercum (*Jour. Amer. Med. Assoc.*, July 15, '95).

Possibility of there being no non-medullated nerve-fibers in the cerebral cortex. Naked axis-cylinders ought to be a physiological impossibility in cerebrum; their presence could only give rise to irregular overflow of energy, with corresponding confusion. It is probably through protoplasmic processes in lateral buds or gemmules that the axons influence protoplasm of dendrons and cells. Their uncovered endings come into close contiguity with gemmules. The gemmules that are specially liable to injury from toxic or morbid influences are the first portions of the neuron to atrophy and disappear in certain diseases. H. J. Berkley (*Medical News*, Nov. 9, '95).

The presence of micro-organisms in the cerebro-spinal fluid and cortex involve their pre-existence in some other part of the organism, and their presence during the course of acute mental disturbances is not relational or causative, but associative. H. A. Tomlinson (*Northwestern Lancet*, Sept. 1, '97).

There are no renal functional insanities. All show positive anatomical lesions. Brains studied in catatonia and involutional melancholia; the neuroglial hyperplasia found in nowise less than in general paralysis. Nissl (*Münchener med. Woch.*, Oct. 31, '99).

V. Psychoses due to gross lesions in the brain. To this class belong syphilitic insanity, post-apoplectic insanity, insanity from tumors and abscesses, and insanity from cranial traumatism.

Four cases of insanity following fractures at the base of the skull. A patient

is not out of danger when a wound in the skull is healed. He may develop insanity as a result of the depression of the skull or splinters of bone, or from a thickening of the bone or from cysts. Seventy-seven such cases have been recorded, in which operation was performed for the resulting insanity, with 5 deaths. Of the 57 cases reported in the last seventeen years, only 2 patients died. Mental recoveries occurred in 51; great improvement in 12; slight improvement in 5; and no improvement in only 4 cases. Two of these 4 were temporarily improved. Harrison (*Med. News; Univ. Med. Mag.*, Jan., '99).

VI. Psychoses due to toxic substances circulating in the brain. In this class are included acute confusional insanity, puerperal insanity; alcoholic, plumbic, and other chronic drug intoxications; uræmic insanity, post-febrile and most cases of post-operative insanity, and insolational insanity.

Specific infection must be included among the causes of mental symptoms. Analogies with nervous affections known to be of microbic origin favor the view that insanities with similar or related phenomena or lesions are also microbic in origin. Mental disorders of pregnancy and puerperal state are probably in a considerable portion of cases toxæmic. C. K. Mills (*Amer. Jour. Med. Sci.*, Nov., '94).

It is of comparatively rare occurrence for actual insanity to develop during course of bodily disease. When the cause is not continuous,—such as poisons, fevers, and traumata,—mental symptoms, in the great majority of cases, disappear; in heart disease and phthisis they may disappear and reappear from time to time; in some cases, such as insanity connected with gouty kidney, they only disappear with death. Reynolds (*Brit. Med. Jour.*, Sept. 28, '95).

Tuberculosis is not believed to be a cause of insanity, but the results of tuberculosis in any of their forms—in other words, tuberculous dyscrasia of any kind—is, just as any other dyscrasia, one of the causes of disease of the

mind, or insanity. Ales Hrdlicka (*Al Shifa*, Jan., '96).

Conclusions as to the possible relation of intestinal autointoxication to mental disturbance: 1. Urines rich in indican contain very little or no preformed sulphuric acid, and are toxic. 2. When the sulphate ratio is materially changed, it is likely to indicate autotoxis in connection with an increase in the amount of combined or ethereal sulphates. 3. Such indications are generally found with acute insanities, in which rapidly developing symptoms occur. 4. Fugacious and changing illusions and hallucinations, unsystematized delusions, confusion, and verbiage in connection with insomnia, pallor, intestinal indigestion, constipation, and rapid exhaustion, are due to autotoxis. 5. Paranoiac states, or those in which concepts are the features; chronic stuporous conditions, and certain forms of dementia have little to do with the formation of intestinal products of putrefaction. 6. Various post-febrile, traumatic, alcoholic, or drug insanities are those in which autotoxis is most constant. 7. The variations in the excretion of combined sulphates keep pace with the changes in the progress of an established insanity, acnes and epileptoid attacks being directly connected with the putrefactive processes. 8. The most successful treatment consists in lavage; intestinal douches; gastric and intestinal antiseptics by means of hydrochloric acid, borax, sodium salicylate, charcoal, guaiacol, or naphthalin in small, repeated doses; and the administration of a combination of the red marrow from the small bones, blood, and glycerin. A. McL. Hamilton (*N. Y. Med. Jour.*, Nov. 14, '96).

In post-febrile insanity abnormal metabolism is a chief etiological factor. Heredity bears a tentative relation, in providing a neurotic weakness and physical instability easily influenced by febrile diseases. Prognosis should be guarded, although recovery is usual in the average case. Norbury (*Jour. Amer. Med. Assoc.*, July 28, 1900).

VII. Psychoses due to developmental changes in the brain, nutritive or structural. In this class are placed pubescent

and climacteric insanity. It may be questioned whether these forms of insanity are due to developmental changes in the brain, but the general similarity in character of the symptoms coincident with the period of puberty or of the menopause justifies the assumption of such changes, even in the absence of direct demonstration.

Investigations carried on at St. Peter's State Hospital, Minnesota, show that menstrual disorder and pelvic disease, while quite common among insane women, in the majority of cases bear no apparent relation to the insanity; nor is the intensity of the mental disturbance in proportion to the gravity of the physical disease. Operative interference is called for in the treatment of pelvic disease among the insane for the same reasons that would determine the necessity for such treatment among the sane. H. A. Tomlinson and M. E. Bassett (*Jour. Amer. Med. Assoc.*, Sept. 30, '99).

Pregnancy may, under certain circumstances, be one of the etiological factors of insanity. Its etiological importance, however, is not proved by either statistics or clinical observation. It is not, therefore, permissible to terminate pregnancy on account of a psychosis, unless there are special indications for such intervention. W. Hirsch (*Med. Record*, Jan. 6, 1900).

Pelvic disorder is often associated with mental disease, and may be a factor in its causation, but it is seldom, if ever, the sole cause of insanity. No characteristic psychosis is associated with pelvic disease in women. No relation is to be found between the intensity of the mental disturbance and the severity and extent of the pelvic disease. J. C. Doolittle (*Va. Med. Semi-monthly*, July 12, 1901).

Symptoms.—The symptoms of insanity may be divided into physical and psychical or mental. The former are referable to the circulatory, digestive, secretory, genito-urinary, and nervous systems. The general nutrition of the body is frequently defective. Chapin

states that "90 per cent. of the admissions to the hospitals present the condition and appearance of some form of bodily ill-health."

The source of mental diseases is not only in the brain itself, but in all the organs. For this reason no pathological changes are found in the brain in many mental diseases, and when, with time, they do appear, they are consecutive, but not primary. In examining and diagnosing the psychical condition of a man, one must closely and minutely examine the whole organism, and not omit any change in any organ, though seemingly insignificant, since experience teaches that very serious changes in the function of the brain arise from insignificant changes either in the nerves or in other organs. Ladislav Kohlberger (*Przegląd Lekarski*, Nos. 25 and 26, '93).

Report on examinations of the urine of 200 insane cases. The average quantity passed in twenty-four hours was 1125 cubic centimetres in male, and 1020 in female. The average specific gravity was 1.019. The reaction was invariably acid. The amount of total solids was under the normal. The urea was decreased. Phosphates were decreased in nearly all the excited cases, and increased in the depressed patients. Oxalates were in excess in 6 of the depressed patients. The chlorides were found increased in 3 epileptics immediately following the seizures and in 1 general paralytic following a convulsive attack. Excess of uric acid was frequently observed in dementia, and several times in general paralysis. Excessive urates were usually associated with dyspepsia. Peptone was found present in 2 of 12 cases of general paralysis. Albumin was found 4 times in the 200 cases. There was frequently reduction of copper in the presence of uric acid. Glucose was present 6 times. Two of these cases were general paralytics. E. G. Klein (*Phila. Med. Jour.*, from *N. Y. Med. Jour.*, Mar. 18, '99).

Anæmia is extremely frequent, especially in states of depression and mental confusion. In the large majority of cases

of acute insanity careful inquiry will develop the fact that preceding the attack there was progressive loss of weight.

Depression of the circulation, weakened heart-action, and an apparent lack of vascular tonus are frequent. They are most notable in melancholia, general paresis, and consecutive dementia. Vasomotor spasm is often present in paranoia, combined with oppression of breathing, and a sense of great anxiety.

In a study of the blood in the insane the hæmoglobin percentage was always below normal. In melancholia this percentage averaged 69.7; in epilepsy, 62.92; in general paralysis, 68.75; and in secondary dementia, 53.75.

The most marked diminution in the number of red corpuscles occurred in the cases of dementia, the average being 4,070,000 per cubic millimetre. The next in order were the epileptics, who presented a corpuscular strength of 4,520,800. The cases of general paralysis gave a count of 4,700,250. W. Johnson Smith (*Jour. of Mental Sci.*, Oct., '90).

Toxicity of blood-serum, in cases of mental disease, found to be as follows: In paranoia it resembles most nearly the normal; in lypemania it is less toxic; in dementia it is always diminished; in general paresis it is increased, as also in acute mania. In epilepsy, imbecility, idiocy, and "moral insanity" the toxicity is normal or diminished. D'Abundo (*Jour. de Méd.*, Feb. 12, '93).

Examination of the post-mortem records of the Dalldorf Asylum in Berlin. Heart-lesions found present in males in 61.67 per cent. and in females in 42.75 per cent. In the sane, according to the records of the Erlangen Pathological Institute, the proportion of heart-lesions is 27 per cent. for males and 23.2 per cent. for females. Valvular lesions are most frequent. C. Strecker (*Schmidt's Jahrbücher*, Sept. 15, '94).

The wide-spread degeneration of the arterial system, commonly found in the insane, plays a very important part in the pathogenesis of mental aberration. Beadles (*Jour. of Mental Science*, Jan., '95).

Examination of fourteen cases with reference to leucocytes. In cases of senile dementia there is an increase; in general paralysis, marked decrease; in cases with tendency to maniacal excitement, great increase. Burton (*Amer. Jour. of Insanity*, Apr., '95).

In clearly established cases of insanity there is a considerable increase in the average frequency of the pulse, both among men and among women. Average from 2172 cases, 84.8 in women and 80.8 in men. Abnormal tracings are found at some stage of the disease in a vast majority of cases. Th. H. Kellogg (*N. Y. Med. Jour.*, July 6, '95).

Diseases of the heart may become the exciting cause of the insanity in predisposed persons. The different symptoms which accompany such disorders, such as pain in the præcordial region, palpitation, exaggerated heart-sounds, feelings of constriction, difficulty of breathing, headache, and giddiness, may all, by causing derangements of sensation and illusions of the senses, become the starting-points of insanity.

Deficiencies of the heart's action may lead to mental affections in persons not predisposed, partly by deranging the circulation of blood in the brain, and partly by altering the chemical action of the blood. The mental disorders thus caused generally take the form of mania hallucinatoria; confusional insanity, with hallucinations. The hallucinations take their color from the abnormal organic feelings.

If the heart disease goes on without alleviation or betterment, the hallucinatory derangement may pass into dementia. Jacob Fischer (*Allge. Zeit. f. Psych.*, B. 54, H. 6, '98).

Blood-pressure examined with Gärtner's tonometer in various forms of insanity. The normal pressure is from 105 to 130 millimetres of mercury. In general paralysis the blood-pressure in the beginning is about normal; later it falls progressively, reaching in the terminal states a very low figure (50 to 80 millimetres). When a remission occurs, the fall in blood-pressure seems to become arrested. In hebephrenia the blood-examinations were unsatisfactory, differ-

ent cases giving different results. In melancholia the blood-pressure was always high. In circular insanity the variations in pressure were parallel with the changes in the psychological state; in the melancholic phases the pressure was very high, in the maniacal low. In epilepsy the author was able to take the blood-pressure during the attack in only two cases. In one he found in the transition from the tonic to the clonic stage the pressure to be 220 millimetres, and in the other during the clonic stage 150 millimetres. In the post-paroxysmal stupor the blood-pressure sank in the first to 80 and in the second to 70 millimetres. Fifteen minutes later it was 135 in the first, and, five minutes after, 125 in the other. A. Pilez (Phila. Med. Jour., from Wiener klin. Woch., Mar. 22, 1900).

The blood-pressure studied in twenty-five cases of mental disease. There is no constant ratio between the motor, mental, and blood-pressure curves; notwithstanding this the observations have a value. The average blood-pressure is low in moderate restlessness or in mental excitement, and high in depressive conditions or in cases where there is diminishing mental activity. The blood-pressure depends on so many factors that it is not surprising if occasional cases are found which do not accord with the usual observations. Some other factor may alter the relation. The rule is that the blood-pressure is increased in depressive states and decreased during excitement. The motor condition has a greater influence on the blood-pressure than the mental state. A moist skin has no special influence on the blood-pressure, although active perspiration may. There is no constant daily variation in the blood-pressure. W. R. Dunton (Boston Med. and Surg. Jour., Oct. 15, 1903).

Fever is not rare in acute states. It is most frequent in states of mental confusion and exaltation, but may also be present in depressive states. Fever is usually a symptom of grave significance and should always lead to a careful physical examination. It may signify a men-

ingitis, a visceral inflammation, or an essential fever.

Observations on the daily oscillations of temperature in functional psychoses. In passive melancholia the temperature is generally diminished. The evening rise is not very pronounced. The same is true of agitated melancholia. In mania there is a rise of 4.5° to 9° F. during the height of the disease. In paranoia the temperature-curve is normal. In stupor it is below normal. Hysterical psychoses show irregular oscillations. In general paresis and dementia the temperature is sometimes much below normal. Th. Ziehen (Deut. med.-Zeit., Aug. 23, '94).

Among the prominent symptoms referable to the digestive system is anorexia, often leading to absolute refusal of food. This is frequently due to gastrointestinal disorders, but in many cases the refusal of food is the consequence of hallucinations or delusions. The patient has a fear of food (sitiophobia), either because he thinks the food will not be digested, or that there is obstruction of the bowels, or total absence or decay of the abdominal viscera, or because he is afraid of being poisoned. The fear of poisoning, due to hallucinations of taste is a frequent symptom of paranoia. Delusions of obstruction or absence of abdominal viscera are often present in melancholia. Want of appetite is also sometimes an expression of the extreme indifference to all subjective sensations or objective impressions in advanced dementia.

In maniacal states there is often an abnormal desire for food. This may alternate with absolute anorexia.

Of 169 cases of visceral diseases, 87 suffered at one time or another from referred pain associated with superficial tenderness. Mental disturbance seemed to stand in direct relation to the intensity of pain. Depression seemed to be associated mainly with the presence of

areas over lower part of chest and over the abdomen. Hallucinations are only present where scalp-tenderness is a marked feature of the sensory disturbance. Henry Head (*Brit. Med. Jour.*, Sept. 28, '95).

Gall-stones found to be twice as frequent in the insane as they are stated to be in the sane. Snell (*Brit. Med. Jour.*, Aug. 12, 19, '93).

Malignant disease is a well-recognized cause of refusal of food by an insane patient, but less attention appears to have been given to gastritis, a common disorder among the sane, and assuredly more so among the insane. Gastritis appears in some cases to be the most probable cause of food-refusal. Many of these cases would, no doubt, recover by simple feeding, but, even in these, lavage before feeding would probably hasten recovery. H. Harold Greenwood (*Jour. Mental Science*, Jan., '98).

Persistent constipation is frequent in melancholia. Diarrhœa is comparatively rare. In many acute forms of mania and melancholia, and in the early stages of general paresis, the patient passes fæces into his clothing or the bed. This is not always due to loss of control of the sphincters, but is sometimes intentional. In advanced dementia, paretic or consecutive, the loss of sphincteric control is usually paralytic.

The perspiratory secretion is usually diminished in melancholia. In mania salivation is often present.

Manifestations on the part of the genito-urinary system are frequent in insanity. In maniacal conditions there is sometimes polyuria. Incontinence is frequent in acute mania and in dementia. Involuntary passage of urine often occurs during epileptic attacks. Sometimes the urine is retained owing to indifference, while its retention may be due to a delusion, as in the case of a doctor mentioned by Chapin, who retained his urine day after day "lest its discharge might endanger the building and human life."

Results of inquiry into the relations of acetone, sugar, and albumin in the urine of insane patients suffering from diarrhœa due to degeneration of the solar plexus. In ordinary intestinal catarrh none of the above are present; but in diarrhœa due to degeneration of the solar plexus sometimes sugar, sometimes albumin, and sometimes both were found. This may aid in diagnosis in some cases. Cristianini (*Jour. de Méd.*, Feb. 12, '93).

Of 150 post-mortem examinations in insanity, 106 cases of chronic renal disease, or 70.6 per cent., found. Beadles (*Jour. Mental Science*, Jan., '95).

In 1700 cases albumin with renal tubercasts detected in urine of more than one-half of the cases of chronic insanity; 25 per cent. presented clinical evidences sufficient to enable any competent practitioner to make a diagnosis of kidney disease. In 75 per cent. of 200 cases the kidneys, examined post-mortem, showed pathological changes. Bondurant (*Amer. Jour. of Insanity*, July, '95).

Exaggerated sexual desire is frequent in mania, and the early stages of general paresis, leading to venereal excesses, but oftener to masturbation. The most shameless acts of exposure and solicitation are seen in females, although masturbation is probably more frequent in males. In depressive states, and in the advanced stages of general paresis, sexual desire and power are diminished. Desire sometimes persists when potency is absent.

Sexual perversion is a symptom that may accompany any neurosis or psychosis, and should not be considered as a distinct affection, but as a part of the general symptomatology of insanity. Behr (*St. Petersburg med. Woch.*, Apr. 4, '92).

In acute psychoses menstruation is nearly always arrested. It is said that one of the earliest signs of improvement in acute insanity in women is a return of the menstrual flow.

Conclusions based on a study of the menstrual function in the insane:—

I. There is no entirely regular menstrual history, if a number of years be taken into account, and that periods falling in from between three and five weeks are to be considered normal.

II. Normal menstruation is an expression of the general condition, and its suppression is often only an indication of the needs of the system, and so is a conservative act of nature.

III. In the chronic insane the menopause makes no radical change in the form of disease.

IV. In acute cases menstruation returns with regained general health, and is an indication that the system can again sustain the loss of force. It is always to be regretted when there is not, at the same time, increased mental vigor.

V. Tonics and general measures are, as a rule, preferable to direct or local treatment, though sometimes both are valuable.

VI. The underlying conditions which cause irregularities of menstruation are oftener the cause of mental disease than those deviations *per se*. Bissell (Northwestern Lancet, Apr. 15, '92).

Of 99 cases of chronic insanity, menstruation, on the whole, regular; irregularity occurred in patients generally over 35. Climacteric appeared, on the whole, earlier. Menstruation had influence almost certainly in 16 or 18 cases, questionably in 18. Erotism rare. Menstrual period seems to exert an actual influence, principally when the pain arising from some genital trouble reacts on the system. Naecke ("Influence of Menstruation on Chronic Psychoses," '95).

The menstrual function in the insane differs in no essential respect from the same process in healthy women, and its influence upon the psychological condition is slight and variable. Nache (Archiv f. Psychiatrie, Feb. 18, '98).

Among the nervous phenomena of insanity the most frequent is insomnia. This is sometimes very persistent in mania and general paresis. In the latter and in confusional states it rapidly leads

to exhaustion. An occasional symptom of general paresis is a great tendency to sleep.

Headache is a symptom in general paresis, cerebral syphilis, and in melancholia. In the latter occipital cephalalgia is said by some observers to be diagnostic. Headache, more or less intense, also attends most cases of mental disturbance depending upon gross lesions in the brain.

Convulsions are present in epilepsy, uræmic insanity, general paresis, and syphilitic insanity. The convulsions in general paresis and syphilitic insanity are not typical epileptic seizures, but of the character described as epileptiform. They also occur at times in alcoholic insanity. The epileptiform attacks of general paresis are usually followed by a comatose or paralytic state lasting several hours or days. In some cases Cheyne-Stokes respiration may be present and still the patient recover from the attack. These apoplectiform seizures also follow true epileptic convulsions at times.

Fixed and irregular pupils or irregularity in the pupillary reaction is frequent in general paresis.

Tremor is present in alcoholic insanity and in certain forms of mental disturbance complicating cerebro-spinal diseases. The fibrillary tremor of the tongue and facial muscles in general paresis is diagnostic in many cases.

The tendon-reflexes are affected (usually diminished) in general paresis, alcoholic insanity, and the mental disturbances of peripheral neuritis. In some forms of melancholia the knee-jerk is increased.

The speech is early affected in general paresis. The scanning speech of the parietic is characteristic. In dementia the speech is often indistinct or slurring.

Certain trophic disturbances may also



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

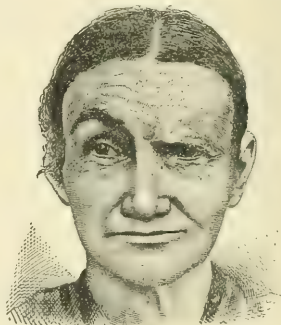


Fig. 6.

Asymmetrical conditions met with in the faces of the insane. (Turner.)

be looked upon as physical symptoms of insanity. Thus, the peculiar deformity of the ear termed "othæmatoma," or "the insane ear," is almost limited to insane persons.

In considerable number of insane women asymmetrical conditions of bilaterally-associated muscles observed, especially of the face.

In 411 insane females, excluding general paralytics, inequality of pupils was found in 25 per cent. In 396 chronic cases, except general paralytics, 35 per cent. had inequality of pupils. In 306 recent cases the tongue, when protruded, was deflected from the middle line in 24 per cent. In a number of cases the muscles of expression were more or less paralyzed on one side. J. Turner (*Jour. of Mental Sci.*, Apr., '92).

DESCRIPTION OF PLATE.—Fig. 1. Asymmetry of expression in the lower part of the face in the case of an imbecile. Fig. 2. A case

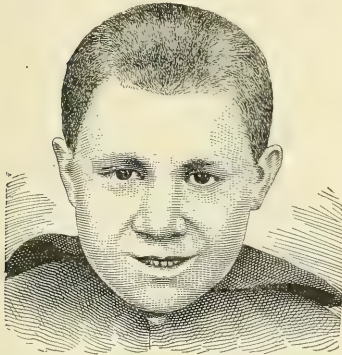


Fig. 1.—Features of degenerated individual. Physical conformation regular, and morally a perfect monster. (*Legrain.*)

of acute melancholia with visceral delusions. Fig. 3. Asymmetry in the forehead, assumed with certain emotional states, in a young phthisical woman. Fig. 4. Another instance of asymmetry in the forehead in a case of melancholia. Fig. 5. A case of acute melancholia. Fig. 6. Asymmetry of the forehead in a case of chronic insanity. (Turner.)

Comparative study of 200 sane and 200 insane men in reference to the development of the mammary gland, in which it is shown that hypertrophy of this organ (gynæcomastia) is from seven to eight times more frequent in the insane. Canger (*Revue Inter. de Bibliog.*, Apr. 25, '93).



Fig. 2.—Features of degenerated individual. Deformed physically, and morally an inoffensive simpleton. (*Legrain.*)

Bilateral hæmatoma of the lobule may occur as the result of traction (violence) on these parts. (*Archives of Otology*, July, '94.)

Absence of overlapping of the anterior portion of the upper dental arcades over the lower is a stigma of degeneration. Camuset (*Annales Médico-psychol.*, Nov., '94).

There is strong evidence in favor of the contention that the proclivity of the insane to othæmatoma is due to a peculiar degeneration in the cartilage of the ear. This change is brought about by the same abnormal nutritional state which induces lesions of scalp, skull, and dura mater, to which the insane are especially prone. Middlemass and Robinson (*Edinburgh Med. Jour.*, Dec., '94).

There is no relation between physical and moral deformities. Individuals who,

from a moral point of view, are depraved may be regular physically and *vice versa*. Legrain (Le Presse Méd., Dec. 21, '95).

As to whether thickened skulls cause mental aberration, personal view expressed that flattening of one side of the skull, obliteration of the sutures, and other irregularities are the precursors of affections of the brain; and that the Pacchionian bodies when enlarged may cause cerebral disturbances. J. F. Briscoe (Jour. Mental Science, Apr., '98).

Defective mental condition is associated usually, especially in the congenital class of cases, with certain physical characteristics, such as a defective hand, deformed palate, wandering eye, a want of co-ordinating power of the body and limbs, and inertness or too great restlessness. Beach (Treatment, Oct. 13, '98).

Deformity of the pupil has hitherto been supposed to occur but rarely among the insane, excepting in general paralysis. Pupillary disturbance has been noted in alcoholic dementia, organic dementia, periodic mania, and in insanity of toxic or infectious origin. But Mignot's thesis shows how commonly these occur. The writer found deformities of the pupil in 83 per cent. of the 77 insane patients examined. In 37 per cent. the pupils were unequal, in 12 per cent. myotic, in 15 per cent. mydriatic, and in 41 per cent. deformed. In 44 per cent. there was some trouble in the reaction to light, in 29 per cent. some trouble in the reaction to accommodation, and in 27 per cent. Argyll-Robertson pupils. Pupillary disturbances are excessively frequent among the insane, especially inequality of the pupils. E. Marandon de Montyel (La Presse Méd., Sept. 18, 1901).

Pupillary alterations in the insane are not transitory, but lasting. The findings are regarded as valuable in the differentiation of insanity from general paralysis. De Montyel (Gaz. Hebdom. de Méd. et de Chir., Jan. 5, 1902).

Bed-sores develop with great rapidity in the insane, especially general paretics and epileptics. A peculiar fragility of the long bones has also been noted.

In chronic disease of the central nerv-

ous system, especially in insanity, the ribs are apt to undergo very considerable morbid changes, which give rise to increased brittleness, and hence predispose the bones to fracture from the slightest violence. Constantinovsky (Med. Chronicle, Oct., '90).

Statement denied that general paralysis of the insane is accompanied by a rarefaction of the osseous tissue, leading to the ready production of fracture and retarding healing of bones, when broken. Christian (La France Méd. et Paris Méd., Apr. 21, '93).

Personal belief that mollities ossium may arise from gross dietetic errors, that rickets is a disease of growth, and that mollities ossium is apparently a disease of decay. The pathological conditions of bones will explain the fragility of the ribs of the sane and of the insane.

Out of 7182 deaths in the insane-asylums of England and Wales, 13 resulted from diseases of joints and bones, and 11 from fractures or dislocations. In 1897, out of 6783 deaths, 15 resulted from diseases of joints and bones and 13 from dislocations and fractures. J. F. Briscoe (Jour. Mental Science, Apr., '98).

In a subject in whom the mental image is morbid the pathology of this image is an almost complete paralysis of inhibition. The appearance of the morbid image, aside from the question of its spontaneity, has place in the field of conscience, without the subject being able to exercise a control or a power of arrest. The normal man has in his mental life numerous morbid mental images, but he generally has conscience and the possibility of utilizing his inhibitory faculty; the mental image in this case is only a fit, so to speak, of passing expansion, the subject being able to manage, more or less voluntarily, the system of images that arise. It is possible in abnormal subjects to have, on the contrary, an inhibitory power which is too strong, but this is only a perfectly explainable appearance; and when there is, so to speak, a sufficiently prolonged arrest of the act, as in the obsessions, it is necessary to attribute the arrest principally to the intensity and the distinctness (*éclat*) of

the mental image. Vaschide and Vurpas (*Revue de Méd.*, Dec. 10, 1902).

PSYCHICAL SYMPTOMS.—Among these is emotional instability, the minor grades of which are especially noticeable in neurasthenic conditions and hysteria. In maniacal states, paranoia, and the early stages of general paresis, the emotional instability is much heightened. The patient is easily "upset"; slight irritants may cause violent outbreaks of anger or rage with destructive attacks.

In melancholia the emotional instability tends to react to painful impressions. The patient is easily moved to tears, or is subject to morbid anxiety, sorrow, or fears, so often present in neurasthenic states and depressive forms of insanity.

The distinctive psychical symptoms of insanity are sensory and intellectual disturbances. The former are termed hallucinations and illusions, and the latter delusions and impulses.

Hallucinations.—An hallucination is a false sense-perception having no objective basis. There may be hallucinations of the special senses: hearing, vision, smell, taste, or of common sensation. Auditory and visual hallucinations are especially frequent, and are often symptoms of dangerous forms of insanity. The patient hears some one call him opprobrious names as he walks along the street, or voices in the wall, the chimney, outside of the door annoy him. Sometimes the voice is an internal one and commands him to kill his persecutor or destroy the latter's property. Hallucinations of hearing are especially frequent in paranoia.

Visual hallucinations are less frequent than those of hearing. They are present in paranoia, mania, and epilepsy. One of the most dangerous visual hallucinations seems to be that of "seeing red."

The suggestion of blood often leads to homicide.

Hallucinations of taste are found in paranoia and melancholia. In the former the patient "tastes poison" in the food and hence refuses to eat, unless he can get food secretly. The hallucinations of taste of the melancholiac are, perhaps, sometimes exaggerated perversions of taste due to digestive disturbances. The same may be said of the hallucinations of smell. Hallucinations of smell are not rare in paranoia, climacteric insanity, melancholia, and especially, according to Savage and Krafft-Ebing, in mental disturbances connected with ovarian and uterine disease.

The hallucinations of the various special senses are often associated. Thus, auditory and visual hallucinations and those of smell and taste are frequently combined. In one well-marked case of paranoia hallucinations of all the senses were present and caused the patient much mental suffering.

Hallucinations of common sensation often give rise to complaints of vermin crawling upon or burrowing in the skin. In some cases they are, doubtless, evolved from paræsthesiæ, being, in fact, illusions, and not hallucinations. Insane persons frequently tear off all clothing and go about in a nude state. This is often regarded as a desire to exhibit the nude body, but it is probable that the clothing is taken off on account of some sensory disturbance attributed to the clothing.

Illusions.—An illusion is a sense-perception having an objective basis, but falsely translated to the consciousness. It is a faulty conception of an actual sense-impression. For example, when an undefined noise is heard as spoken language; when a fog is taken for the smoke of a burning city; when the pres-

sure of a closely-fitting collar gives the impression and causes the feeling of strangulation,—these are illusions.

Delusions.—Delusions are false conceptions and judgments. Wood's definition of a delusion—the best and clearest ever formulated—is: “A faulty belief concerning a subject capable of physical demonstration out of which the person cannot be reasoned by adequate methods for the time being.”

According to this definition all faulty beliefs or false judgments are not delusions. A faulty belief may be a delusion in one person and not in another. It is largely a matter of education, or of environment. Thus, certain political views or religious beliefs held by large numbers of the people appear to others as delusions. Persons without a physical or mathematical education may believe that perpetual motion and squaring the circle are possible. Physicists and mathematicians know that they are not possible. The contrary belief is not a delusion, but simply ignorance. The prevalent belief among some communities in the North during the late war between the States, that all rebels had horns, was similarly ignorance and not a delusion, although the writer knew persons who held the belief.

A difference is made between insane and sane hallucinations and delusions. The former are said to dominate the life and acts of the subject, while in the life and conduct of the latter the hallucinations and delusions are merely incidental. The distinction is an arbitrary and indefinite one.

[Shakespeare had apparently a clear notion of the difference. In “Macbeth,” in the dagger scene, the hallucination is evidently recognized by the chief actor as a false sense-impression, since he asks: “Art thou but a dagger of the mind, a false creation proceeding from the *heat-*

oppressed brain?” In the banquet-scene, on the contrary, all doubt of the reality of the vision has ceased when he addresses Banquo's apparition as if there were no doubt of its real presence.

GEORGE H. ROHE.]

Delusions are divided into expansive delusions, or delusions of grandeur; depressive delusions, or delusions of debasement; delusions of persecution, and religious and sexual delusions. The delusions of grandeur and of debasement are the fundamental varieties. The others are mere modifications of them. Persecutory, religious, and sexual delusions are based upon some delusion of exalted or debased personality. Thus an insane person regards himself as persecuted because he is the offspring of royalty, illegally kept out of his rightful sphere; another is the saviour of mankind, but, like the Son of God, he has come unto his own and his own have known him not; another has boundless sexual power, and can generate a higher and nobler class of beings, but his enemies destroy or fraudulently substitute some inferior being in the place of the paragon. In all these phases of delusive belief the grandiose character is maintained, and the idea of persecution is merely a further development thereof.

Delusions of grandeur are present in general paresis, in which disease they have long been regarded as characteristic. They are also an essential element in paranoia, in which persecutory delusions are an outgrowth of them. In melancholia, delusions of debasement are often characteristic. In mania delusions of grandeur are often transitory and varying; in general paresis they are extremely extravagant, and in paranoia they are fixed and in a sense logical.

Case of systematic delirium of grandeur without noticeable lowering of the intellect. G. Ballet and Arnaud (*Annales Médico-psychol.*, Mar., Apr., '95).

Delusions of debasement or unworthiness are common in melancholia; they are rare in paranoia.

Delusions of persecution are characteristic of paranoia. In this form of insanity they are closely connected with hallucinations of hearing, smell and taste; indeed, delusions in the majority of cases are outgrowths of hallucinations. Persecutory delusions are extremely dangerous symptoms. Under the influence of such delusions most of the acts of violence of the insane are committed.

Religious delusions are found in paranoia, epilepsy, and melancholia. In paranoia and epilepsy they are nearly always of an expansive character. The subject fancies himself or herself an exalted religious personage, and may even claim the attributes of the Deity. In other cases he or she holds communication with God, the Saviour, the Virgin Mary, or some prominent saint. In these persons hallucinations of hearing and vision are always present. The religious delusions of melancholia are usually permeated with a profound sense of unworthiness of the subject, while the paranoiac is saturated, so to speak, with the sense of his own importance and power, and is always convinced that he is entitled to more honor than the world renders him; the melancholiac, on the other hand, constantly and loudly protests his utter unworthiness, his sinfulness, the impossibility of ever regaining the lost grace of God.

Sexual delusions of an expansive character are present in the early stages of general paresis, in mania, and in paranoia. In the latter they are combined usually with persecutory delusions. The persistent doubts of sexual power so often found in neurasthenics cannot be regarded as delusions.

Morbid Impulses. Impulsive Acts.—When an epileptic during an hallucinatory aura attacks another person, a paranoiac under the influence of his persecutory delusions commits murder, or a sexual pervert cohabits with animals or with dead bodies, the acts are said to be *impulsive*, and committed in obedience to an imperative impulse, conception, or idea. The Germans call these impulses "*Zwangsvorstellungen*," literally coercive conceptions. The French term is "*obsessions*." The numerous so-called monomanias and monophobias of authors belong to this class of symptoms. Thus suicidal and homicidal mania, dipso-mania, pyromania, kleptomania, erotomania, onomatomania, are not special varieties of insanity, but are merely coercive impulses, often irresistible.

An impulsive tendency to suicide does not constitute a special variety of insanity; it is merely a symptom of a depressive mental state. It is most frequently a symptom of melancholia, but may be present in other forms of mental disturbance.

General Diagnosis.—The differentiation of the individual forms of insanity is often difficult, but it is still more difficult at times to say with positiveness that a person under examination is sane or insane. This is largely due to the fact that there is no absolute standard of sanity. The outward expression of insanity of thought and feeling is manifested through conduct, but as there is no general standard of sane conduct, it is necessary to compare the conduct of the person in question with the conduct of the generality of persons living under the same environments or to compare the conduct of the subject with his own previous mode of life. The behavior of a thief, a tramp, a drunkard, or a prostitute is not approved by society, but the

thief and his proscribed companions are not considered as insane, either by society in general or by each other. But if a clergyman becomes a thief; a millionaire, a tramp, an ascetic, a drunkard; or one who has hitherto been a model of womanly virtue a prostitute, there are grave reasons for suspecting the sanity of the person thus offending. The general diagnosis of insanity must take into account not only the subject's conduct at the time being, but his previous history and his environment. Specific details will be given in the consideration of the special forms of insanity.

General Prognosis.—Contrary to common belief, insanity is curable in a considerable proportion of cases. If appropriate treatment is promptly instituted the recovery-rate of all cases should reach at least 40 per cent. If certain groups that are incurable, such as imbecility, paranoia, general paresis, and epileptic and other secondary dementias are excluded, the proportion of recoveries should be much larger. It is not unreasonable to expect recovery in 75 per cent. of the psychoses due to nutritive disturbances or toxic conditions.

The insane succumb in but a small proportion to infectious disease as compared with the general population. Of 15,248 deaths in Italian asylums, 8.46 per cent. were due to tuberculosis, 4.16 per cent. to pneumonia, and 1.75 per cent. to typhoid fever. Of 307,477 deaths in the general population, 12.22 per cent. were from tuberculosis, 15.50 per cent. from pneumonia, and 2.95 per cent. from typhoid fever. Gucci (*Centralb. f. Nervenhilfskunde*, etc., No. 26, '89).

The prognosis of insanity in childhood is, on the whole, favorable if there is no neuropathic ancestry. If, however, the child shows evidences of psychopathic heredity, the prognosis is bad. Moreau de Tour (*Annales d'Hypnologie et de Psych.*, Dec., '91).

Of 2176 insane persons admitted into the Eastern Michigan Asylum, 378, or

17.3 per cent., recovered without relapse, 91, or 4.1 per cent., recovered, relapsing one or more times; 256, or 11.1 per cent., were discharged improved, remaining at home without again resorting to the asylum; and 522, or 23.9 per cent., died. The low absolute-recovery rate is due to the fact that all sorts of cases in various stages of chronic insanity are admitted. E. A. Christian (*Amer. Lancet*, May, '94).

The influence of microbial diseases among the insane leads, in the majority of cases, when the subjects are young, to a more or less considerable amelioration of the mental condition. M. René Charon (*Archives de Neurol.*, May, '96).

The majority of authors agree that the prognosis of insanity, complicated by "insane-ear," is sufficient evidence of its incurability, while a few contend that there are cases in which perfect recovery has taken place. Out of 7000 admissions to the Connecticut Hospital for the Insane there was only one case that developed hæmatoma aurium and remained well. L. P. Clark (*Amer. Med.-Surg. Bull.*, Aug. 22, '96).

Decidedly hereditary cases of insanity are often the most curable, although there is more likelihood of a relapse than in those in which the hereditary tendency is absent.

It has been estimated that 63 per cent. of recoveries from insanity take place before the age of twenty-five, although the young are more subject to relapses. The menopause is another period of life at which recovery occurs in many cases; but the disease is usually of long duration, not ending until the cessation of the menstrual function is complete. Genuine climacteric insanity, however, is rare.

Acute forms of insanity in which recovery is especially apt to occur are stuporous insanity, or so-called primary dementia; confusional insanity; puerperal and lactation insanity; and that which follows acute physical disorders. But systematized delusional insanity belongs to the chronic class and is rarely curable. The secondary, or terminal, stage, dementia, as well as recurrent and alternating insanity, is hopelessly incurable.

General paralysis of the insane is al-

most inevitably fatal. Henry R. Stedman (Boston Med. and Surg. Jour., June 10, '97).

In the Eastern Michigan Asylum, out of 327 cases of mania, 190 (or 58.7 per cent.) recovered; and, out of 800 cases of melancholia, 282, giving a percentage of 35.2, recovered. Recoveries from attacks of melancholia occur much later than recoveries from mania; among the latter a chronic or recurrent condition results more rapidly. I. H. Neff (Treatment, Apr. 13, '99).

Of 206 cases of acute mania, 171 recovered, 83 per cent., the ratio of deaths being thus only 3.8 per cent. Although excitement and sleeplessness had been marked in all, *sedatives were not used*: a fact to which the high proportion of recoveries was attributed. C. K. Hitchcock (Jour. of Mental Science, Jan., 1900).

Case of melancholia in a man, 28 years of age, of intemperate habits, with a specific history. He passed into a condition of stupor, refusing to leave his bed or voluntarily to take any nourishment, and remained in this state three and a half years. During all this period he was fed three times a day. He finally began to show signs of returning mental activity, and was subsequently discharged as recovered. Cecil MacCoy (Jour. Nervous and Mental Dis., July, 1901).

Toxic action is by far the most important factor in the pathogenesis of insanity. The large majority of cases of insanity are not primarily diseases of the brain at all, but are dependent upon the action of toxins derived from elsewhere that affect the functional activity of the cortical nerve-cells by disordering their metabolism and often permanently damaging or even destroying many of them. The common view that the mental disease is the primary condition, and that any accompanying bodily disease is secondary, is, in general, founded upon an erroneous conception of what is taking place. W. F. Robertson (Brit. Med. Jour., Oct. 26, 1901).

General Principles of Treatment.—Inasmuch as insanity is here considered as

purely physical disease, it is evident that purely psychological remedies occupy a very subordinate part in the treatment. They are limited to what may be called, in a general way, the management, or handling, of the patient. A tactful nurse—one who combines the *suaviter in modo* with the *fortiter in re*—is here essential. Agreeable surroundings and keeping at a distance sources of irritation may also be classed with the psychological remedies. Isolation is not to be recommended, especially in hallucinatory and delusional forms.

Regarding the much-discussed question of institutional or home treatment, the decision should in all cases be in favor of the former. It is, of course, assumed that the institution is up-to-date in all respects, and that the treatment is according to modern methods.

The general physical treatment consists in good food, rest in bed in acute cases, and out-door life after the acute stage is over and danger of exhaustion has passed.

In the majority of cases it will be found that the digestive and assimilative functions require attention, and that restorative tonics are indicated.

Mental disease is usually attended with malnutrition, and in treating insanity the nutrition should be made as perfect as possible, and as soon as possible. A. R. Moulton (Amer. Jour. Insanity, Oct., '94).

Treatment by rest in bed tried thoroughly in a large number of cases with very favorable results. There is no restraint, but the patients are kept continuously under observation. If he cannot be kept in a ward he is put into a separate room. Even for noisy patients this is much more satisfactory than isolation in a cell without observation. No difficulty experienced in keeping patients in bed. They are much more easily watched, and bad habits can be

more effectually prevented. Patients rise for their meals and to go to the closet. Wizel (*Ann. Med.-Psych.*, Nos. 1 and 2, 1901).

Insomnia can generally be combated by baths, out-door life, attention to hours of feeding, proper bed-clothing, and, when necessary, hypnotics. These medicines should, however, be avoided if possible, as they are nearly always attended by some untoward effects.

In the employment of hypnotic measures excellent results may be obtained with the wet pack. Though it produces sleep in patients with a very high degree of excitement, in some cases it became necessary to repeat the application frequently for a period extending over half a year, but no diminution in its effects were observed. Umpfenbach (*Ther. Monats.*, June, '89).

Forty-six to 62 grains of sulphonal are necessary to get the best hypnotic effect. Sleep is produced quite rapidly. The same persistence of the hypnotic effect after the suspension of the drug is observed. The nervous disturbances from sulphonal are divided into four groups: (1) those which compare to the well-known feelings in the morning, after a heavy drinking-bout of the night before; (2) that of drunkenness, with all its peculiar individual traits; (3) where ideation and memory are failing; (4) those of stupor, vertigo, difficulty in walking and speech, and even paresis of the limbs. Marandon de Montyel (*La France Méd.*, Nov. 14, '89).

Sulphonal found useful in many cases among the insane, and comparatively inert among others. In 100 cases it was followed with 80 per cent. of successes, the average time in which sleep came on being three hours. The average dose administered was 12 grains. L. C. Toney (*St. Louis Med. and Surg. Jour.*, Jan., '91).

The hydrochlorate of morphine is of great value in the treatment of mental and nervous disorders. Aug. Voisin (*Bull. Gén. de Thé.*, Apr. 15, '91).

In comparing trional with sulphonal, preference given to the former as an hyp-

notic. Steiner (*Deutsche med. Woch.*, No. 13, '95).

Chlorobrom—a mixture of equal parts of potassium bromide and chloralamid dissolved in water—has less action upon the heart and blood-vessels than chloral. Not particularly disagreeable to take and leaves no ill after-effects. Wade (*Amer. Jour. of Insanity*, Apr., '95).

Sulphonal administered to forty-one insane females. Disagreeable effects frequently observed: frequent spitting, uneasiness, vomiting, staggering gait, and sometimes diarrhœa. If sulphonal was discontinued the patients, without exception, recovered completely. It should never be given in daily doses of 30 to 45 grains more than several months without discontinuing it from time to time. Schedtler (*Therap. Monats.*, June, '95).

The special and elective action of potassium bromide on the bulbar region, with elective action of opiates and chloral on cerebral lobes, may be advantageously combined. The following mixture recommended;—

R Potassium bromide, 2 drachms.

Chloral-hydrate, $\frac{1}{2}$ drachm.

Syrup of morphine (French Codex, $\frac{1}{4}$ grain to the ounce), 1 ounce.

Distilled water, 3 $\frac{1}{2}$ ounces.—M.

Lufs (*Lyon Méd.*, July 14, '95).

Unusual toxic effect of trional observed in a case of insomnia when renewed small doses were administered. J. W. Irwin (*Amer. Therapist*, Oct., '95).

Lactophen given for insomnia in over 200 cases, with very good results. The dose given varied from 15 to 45 grains, the drug being administered in some sweet emulsion. Like most hypnotics, it loses its effect after continued use, but after a short intermission can be used again with good results. It is quite safe and more generally useful—in insane subjects—than opium, chloral, trional, or other hypnotics. Cristiani (*Rif. Med.*, June, '98).

Opium is rarely necessary in insanity in children; when sedatives are required, a warm bath daily will be found useful, and when there is intense delirium one can add to this the application of cold to the head; in other cases a wet pack will be preferable. The administration

of bromide of sodium in doses according to the age of the child will act as a calming agent, especially in cases of epileptic mania. In cases where there is much sleeplessness trional, in doses of from 3 to 8 grains, may be given for a few nights. A tonic treatment is to be pursued, and in those who masturbate the administration of quinine and camphor will be found convenient. Care must be taken to keep the bowels well open. Open-air exercise is to be employed in all cases, but gymnastics should be made use of as a recreation in cases of melancholia, and as a regulator of movements in choreic insanity. In some cases it will be necessary to stop all intellectual occupation; in others to encourage it, and also to make the child interested in the general affairs of life.

One of the most important parts, if not the most important, of the treatment is the separation of the child from his friends. Visits from friends should be permitted rarely at first, and regarded as a favor or reward for good behavior.

Children suffering from moral insanity should be put into institutions in which they should undergo industrial training, and be kept under control during the period of their lives.

The prevention of insanity in childhood is most important. Life in the open air, work in a garden or on a farm, recreation of all sorts, absence of forced prolonged intellectual labor, and the suppression of excessive emotion are the chief hygienic indications in those predisposed to insanity. Fletcher Beach (*Journal of Mental Science*, July, '98).

To administer trional to the insane an effervescent-magnesia solution is not only a convenient method, but it permits a smaller dose: 7 to 15 grains. Its more easy absorption is due to the presence of carbon dioxide. Thus administered, gastric and intestinal disturbances, so easily excited in the insane, are avoided. Corrado Ferrarini (*La Riforma Medica*, No. 109, 1900).

When food is refused on account of gastric derangement, lavage of the stomach and careful systematic feeding will soon correct the disturbance. Refusal

owing to hallucinations and delusions may sometimes be overcome by tactful solicitation, but in other cases forced alimentation must be resorted to. Often the tubular mouthed vessel called a "duck" will enable sufficient liquid food to be introduced. Where this is not successful the food must be given through a nasal or œsophageal tube. Many alienists prefer the former, but in the experience of the writer the œsophageal tube is as convenient as the other, and its larger calibre allows the requisite quantity of food to be introduced into the stomach more rapidly.

Care must be taken to vary the food given through the tube. The constant use of milk or milk and eggs often offends the stomach and failure of digestion results. Such vegetables as potatoes, rice, beans, peas, or lentils can be mashed and reduced with milk to a thick fluid mass, easily passed through the tube. Beef can also, after thorough boiling, be pounded in a mortar, or ground in a meat-grinder and likewise reduced to a thick paste. The various beef-juices (not extracts) and beef-powders, such as Mosqueras, or peptonoids, may also be given in the same way.

(See ANOREXIA NERVOSA, volume i.)

Sitiophobia treated by first washing out the stomach through the stomach-tube, and then introducing food through the same tube. There is, in most cases of refusal of food, a catarrhal state of the stomach at the bottom of the hallucinations. Voisin (*Bull. Gén. de Thé.*, Jan. 30, '91).

Complete refusal of food for twenty-four hours by a strong, well-nourished patient, and the missing of two meals by a feeble one considered sufficient indications for the stomach-tube. Harris-Liston (*Brit. Med. Jour.*, Feb. 13, '97).

I have found the subcutaneous infusion of an albumin-salt solution ex-

tremely valuable in cases of sitiophobia, as well as in other conditions in which food could not be taken into or retained in the stomach. The fluid consists of a pint of sterilized normal salt solution (0.6 per cent. chloride of sodium, about 45 grains to the pint) in which the whites of two eggs have been whipped up and the whole strained through gauze. This is put into a nasal-douche bottle, to the tube of which is attached an aspirator-needle of small calibre. The skin over the back, loins, or buttocks is disinfected and after the fluid is allowed to flow through the tube and needle to get rid of the contained air, the point of the needle is inserted well under the skin. The bottle is then moderately elevated and the fluid allowed slowly to penetrate the connective tissue. It takes about fifteen minutes to infuse a pint of fluid under the skin. The prominent swelling which results usually disappears in the course of an hour or two. The proceeding is not very painful, and leaves no bad local after-effects.

Case of somatic insanity treated by means of subcutaneous injections of salt solution, two quarts a day being used until 15 quarts had been introduced. The improvement was marked and immediate. G. F. Keene (Boston Med. and Surg. Jour., Oct. 4, '94).

In some cases of acute mental disease, cases showing autoinfective symptoms, and in cases refusing food, excellent results have followed the employment by hypodermic transfusion of large quantities (one litre) of 0.75-per-cent. blood-warm sterilized solution of sodium chloride. The injections are made into the loose areolar tissue of the abdominal wall or gluteal region once daily. James T. Searcy (Alienist and Neurol., Apr., '97).

The injection of a normal salt solution recommended. The patient lies prone on the bed, and the buttocks are washed with an aseptic boric-acid solution; a fine trocar is plunged deeply into the muscular tissue of the buttock. The tro-

car is connected with an India-rubber tube, to the other end of which a funnel or bottle is attached, and from the latter the sterilized normal salt solution is allowed gradually to pass through the tube into the intermuscular tissue of the buttock. The solution should be of a temperature between 37° and 40° C., and be slowly run into the tissues in quantities of about 1 pint at a time. De Boeck (Jour. of Mental Science, Apr., '99).

The writer states that the calnative action of certain remedies (duboisine, hyoscine, bromides, etc.) is augmented when these drugs are administered hypodermically, dissolved in 400 cubic centimetres ($\frac{1}{4}$ pint) of physiological salt solution, for this kind of internal lavement seems to disembarrass the organism of the intoxication. By this method one obtains the same effects with only 4 decimilligrammes ($\frac{1}{100}$ grain) of duboisine sulphate and 3 decimilligrammes ($\frac{1}{200}$ grain) of hyoscine hydrate as are obtainable with twice that dose of the drugs given without the serum. A gramme of sodium bromide introduced in this way will suffice to induce a sensible and lasting sedative effect. Gaspero (New York Med. Jour., from Ther. der Gegenwart, Sept., 1902).

Among the means of treatment employed in acute cases of insanity, none surpasses, in effect, rest in bed. The patient with acute confusional insanity, mania, or melancholia, usually comes under the notice of the physician in a condition of great exhaustion. Bed-rest in these cases is imperative. I have found it better in these cases to treat the patient in an open ward, in the presence of other patients, and not in an isolating chamber. The suggestive influence of other persons in bed and apparently sick has a favorable effect, and the patient soon yields to the suggestions of physicians and nurses and regards himself as sick and in need of treatment.

The insane should be regarded simply as sick persons; they should be removed to hospitals, or detained there in the same manner as cases of infectious dis-

ease are taken in charge and isolated by the health authorities. Stephen Smith (*Amer. Jour. of Insanity*, Jan., '94).

In a great number of cases of fully developed mental disease of some standing, with fits of alarm, hallucinations, maniacal excitement, etc., the symptoms yield to rest of one or two weeks in bed, whereas in other circumstances a much longer time would certainly be required. L. Meyer (*Jour. Mental Sci.*, Apr., '96).

Twenty-eight male patients, including 8 general paralytics, 6 cases of dementia, 5 of melancholia, 4 of paranoia, and 1 each of catatonia, psychosis, hysteria, senile dementia, and cerebral syphilis treated with complete rest in bed. The weight of the patient usually fell at first, but increased again after some weeks. As regards the duration or cure of the disease, bed-treatment has no influence. Trapesnikow (*Neurol. Cent.*, p. 142, '98).

Series of female patients treated by rest in bed, including 3 cases of secondary dementia, 1 of chronic paranoia, 2 with chronic hallucinations, 2 with amentia, and 1 each with maniacal exaltation, melancholia, circular insanity, periodic insanity, and organic cerebral dementia. In some patients good results were obtained, but not in all. Weight was often lost, and sleep, appetite, and the action of the bowels were all prejudicially interfered with, and hypnotics had to be used just as frequently. Bed-treatment is only useful for individual cases. Ossipow (*Neurol. Centralb.*, p. 142, '98).

Travel may be good in one stage, and bad in another, of the same disease. Neurasthenic, hysterical conditions require rest, though the patient may seem strong. Certain self-centred patients gain no benefit from travel. In delusions of persecution, suicidal or homicidal tendencies, and active and changing mental conditions travel is contra-indicated. Richard Dewey (*Jour. of Amer. Med. Assoc.*, Aug. 18, 1900).

Rest in bed is important in acute mental disease. The horizontal position favors the circulation in the brain and aids in overcoming cerebral and constitutional exhaustion, which is present in a large proportion of cases. Sérieux and Farnurier (*Med. News*, Sept. 15, 1900).

Mechanical restraint and seclusion in a dark or barred room are not necessary in the treatment of insanity in any of its forms and should never be employed.

There is a class of cases in which the use of mechanical restraint is beneficial, but it should never be used except for the protection of the patient; and not for cases of violence or destructiveness. P. Maury Deas (*Jour. of Mental Science*, Jan., '96).

Emphatic condemnation of the custom of using dark cells for the purposes of punishment in prisons, the main cause of insanity among long-term prisoners. Twenty-three per cent. of the life-men in the prisons of the State of New York are inmates of the Matteawan State Hospital to-day. Most of them are hopelessly insane. H. E. Allison (*Albany Med. Annals*, Dec., '97).

Special Forms of Insanity.

GROUP I. PSYCHOSES DUE TO IMPERFECT DEVELOPMENT OF THE BRAIN.

Idiocy and Imbecility.—These two conditions of defective mental function are merely different in degree. They are both dependent upon defective or arrested cerebral development. This defective development may be hereditary, congenital, or acquired; that is, it may occur in intra-uterine life, during the parturient process or after birth. In the United States idiots and imbeciles are generally grouped under the term "feeble-minded."

Idiots sometimes appear to be without any intellectual development whatever, having no power of thought, memory, or judgment. But these extreme degrees, if they occur at all, are rare. The sensory organs may be normal, and the vegetative functions well performed.

In imbecility the arrest or perverted development of the brain has not proceeded to the same degree, and there is more or less intellectual power. The memory and certain special faculties, as

the musical, are sometimes highly developed in imbeciles.

Frequency.—The proportion of feeble-minded is about 1 in 500 of population. Males outnumber females 2 to 1.

Causation.—Idiocy and imbecility are hereditary in about one-half of all cases. The principal conditions in the ancestry supposed to influence the heredity are insanity, nervous diseases, intemperance, consanguinity, and tuberculosis. Contrary to general belief, intemperance in the parents is a factor in only about 10 per cent.

The causes of idiocy and imbecility are many and varied. Subtle causes, such as maternal impressions during pregnancy, must not be accepted without searching for more substantial underlying causes. Hereditary degeneracy, psychoses, and psychoneuroses of the parents are some of the causes. Acute infectious and contagious diseases of the mother during pregnancy are causes, but additional search must always be made for underlying causes other than these. Syphilis is a cause. Autoinfection, myxœdema, is a cause. If the acute contagious and infectious diseases during childhood leave the child an idiot or an imbecile, that child's heredity must be well scrutinized, as the latter is most certainly the underlying cause. Alcoholism of the parents is the major cause responsible for the birth of idiot and imbecile children, according to the study of the cases cited. Alcoholism of the parents not only causes idiocy and imbecility of the offspring, but also acts as a strong factor in reducing the birth-rate and increasing the death-rate. Children of alcoholic parents, if not idiots or imbeciles, are apt to be invalid in many other ways. Children of alcoholic parents generally die in early infancy of meningitis. L. G. Robinovitch (*Jour. of Mental Path.*, July, 1901).

On 258 cases examined, it was possible to determine the probable origin in 176. Of these 113 were congenital, 63 were non-congenital or acquired cases. The causes of non-congenital idiocy and

imbecility were trauma and disease. Trauma was possibly responsible for 19 per cent. of the cases. The most prolific causes of congenital idiocy and imbecility noted were alcohol, syphilis, uterine disease, and the accidents of labor. Bullard (*Boston Med. and Surg. Jour.*, May 5, 1904).

A considerable proportion of cases of feeble-mindedness is doubtless due to traumatisms during the process of birth. Prolonged labor, subjecting the brain to undue compression, direct traumatisms from the use of instruments or improper methods of delivery; convulsions in the mother, with consequent poisoning of the foetal blood by carbon dioxide or by anæsthetics used to relieve the maternal convulsions; or premature birth may produce such a disturbance of nutrition in the brain as to arrest or retard its development. It is probable that the number of children in whom the arrest of development has begun at the time of birth is much greater than is generally supposed. Many of the cases of idiocy and imbecility among the offspring of parents entirely healthy, or of high intellectual ability, and which furnish such choice food for heartless gossip among the ignorant and uncharitable doubtless begin as the result of some such avoidable or unavoidable accident. The actual proportion is not ascertainable.

ACQUIRED IDIOCY, beginning in infancy or childhood, is due to the toxic influence of infectious diseases, to injuries, rachitis, meningeal inflammation, fright, convulsions, and improper training.

Symptoms.—The physical stigmata of degeneration are well marked in idiocy. Of these the most notable is microcephaly, or abnormal smallness of the cranium. This may be due either to imperfect growth of the brain from intrinsic causes, or to premature closure and ossification of the cranial sutures.

The last-named cause was formerly supposed to be much more potent than it is regarded at present.

In contrast to microcephaly, many cases of idiocy show a larger skull than normal. In these cases there is usually hydrocephalus, which may sometimes be extreme.

Irregularity or asymmetry of the skull and brain are also present at times.

Defective development of the remainder of the body is frequent.

Eleven cases of funnel-breast collected from the literature and five new cases reported. Funnel-breast is one sign of

diminished size of the heart is greater in proportion than the diminished size of the brain. Wulff (*Jour. of Mental Science*, Jan., '95).

Pareses and paralyses are among the physical symptoms often noted. Epilepsy and other forms of convulsions are also frequent complications. There may be various tics, athetosis, and atrophy of paralyzed limbs. Strabismus is common.

Deafness is extremely uncommon among the feeble-minded; on the contrary, an acuity of hearing with a considerable development of the musical sense, is not infrequent.



Funnel-shaped thorax. (*Ramadier and Sérieux.*)

physical degeneration. In ten of the reported cases there were hereditary psychopathic conditions (idiocy, epilepsy, imbecility, and delusional insanity). In only one of the cases was there slight scoliosis. No evidence of rachitis. In the other cases the history was incomplete. J. Ramadier and P. Sérieux (*Nouvelle Icon. de la Salpêtrière*, Sept., Oct., '91).

The comparative smallness and weakness of the heart peculiar to idiots is general, and not the result of atrophy or degeneration following disease. The di-

PSYCHICAL SYMPTOMS.—The defective intelligence is the most marked characteristic of the idiot. There may be shrewdness, or rather cunning, a retentive memory, acuteness of the special senses, and even the mathematical faculty may be highly developed in certain directions, but judgment and self-control are lacking. There is nearly always defect of articulation; indeed, articulate voice may be absent altogether, the only vocal sound the idiot can make

being an inarticulate cry. The expression is generally placid and good-natured. He seems often to feel the necessity of guidance, and fawns upon those with whom he comes in contact. At other times, however, especially when his training has been neglected and he has acquired bad habits, his expression may become brutified. At best, the idiot is not an agreeable companion.

Self-control is often lacking. The slightest irritation causes an outbreak of rage during which he may commit violence. Sexual instincts are often active. Masturbation is frequent and its constant practice still further brutifies the defective subject. The uncontrolled sexual desire may also lead to offenses against morality in both sexes. Sexual perversion is not infrequent.

There is often a perversity of character, a collection of bad habits, which make the idiot or imbecile an extremely offensive companion. He will strike without provocation, spit at those who endeavor to correct him, and he seems to have an especial tendency to soil his clothing with excretal matters. It is very probable that these habits are the result of bad training, some of them being adopted as means of defense against those who use the idiot as a butt for their mis-called pleasantries,—unpleasantries would seem the better word.

The so-called "moral idiot" belongs to the same class with the other idiots. While his apparently total lack of regard for the moral law is the most prominent of his characteristics, a careful examination and consideration of his history will show that the essential feature of his malady is weak-mindedness.

Cretinoid idiocy differs entirely in pathology and etiology and is treated under another heading. (See INFANTILE MYXEDEMA, volume iii.)

Diagnosis.—In the absence of a history of the subject the only difficulty of diagnosis possible is with consecutive dementia. In advanced stages of this condition the resemblance to imbecility is sometimes great, but a short period of observation will usually show points of divergence. The malady of the chronic dement is progressive; the symptoms of the idiot remain unchanged.

The recognition of idiocy in early life is important, but the delay in the normal development of the intellectual powers generally postpones the recognition of feeble-mindedness in children until the third or fourth year.

Prognosis.—The prognosis of idiocy and imbecility, taking into account the pathogeny of the condition, is unfavorable. There is at present no means known to medical science or art by which a brain defective in structure or organization can be made perfect. But training by tactful teachers in properly equipped institutions, and in some cases of contracted skull, surgical intervention, to permit the brain to expand, have wrought great improvement. In cretinoid cases the administration of thyroid extract has produced marked changes for the better. (See ANIMAL EXTRACTS, volume i.)

Treatment.—The treatment of feeble-mindedness should be primarily prophylactic. The irrational way in which many children are brought up leads naturally to imbecility. If anatomical defects are at the base of the feeble-mindedness, no method of treatment known offers any chance of improvement. In cases where premature synostosis of the skull is certainly present, there should be no hesitation to do Lannelongue's operation of craniectomy. While the results of the operation to the present time have not been generally encouraging, there is sufficient ground for

the hope that some good will result from the operation in properly-selected cases.

The main reliance must be placed upon good pedagogic methods. The idiot must be taken in hand as early as practicable by a qualified teacher. Correct habits must be taught and their practice enforced by constant supervision. The idiot must be looked upon as an unfortunate, and not as a pervert with criminal instincts. Endeavors must be made to lead him to correct behavior. It will be found usually much easier to lead than to drive him.

The chief inference to be drawn from a study of sections taken from every part of the central nervous system in personal and other cases of amaurotic family idiocy is that the morbid process in this disease affects primarily, or at least to a great extent, the entire gray matter of the brain and spinal cord. The degeneration of the white fibres of the anterior and lateral pyramidal tracts is in all probability secondary, but not nearly so great or so marked as one would expect with such advanced disease of the ganglionic tissue. It is probable that the relative involvement of the gray and white matter may vary in different patients with this disease. B. Sachs (Jour. of Nerv. and Men. Dis., Jan., 1903).

The mistake must not be made of expecting too much from training an idiot. The best qualified teacher cannot make brains. He can only utilize those he finds ready to hand.

Given a case of congenital idiocy which becomes apparent during early infancy and which does not present any acute manifestations, it is impossible to make a positive diagnosis regarding the true origin of the affection on the basis of clinical facts. The idea, introduced by Koenig and Freud, calling for the restriction, on clinical principles, of the limits of the so-called common idiocy (degenerative, genetic, evolutive, biopathic) is erroneous. Neuropsychopathic heredity is generally found in cases of

cerebroplegias. The duration depends on the nature and the gravity of the lesions. The educability of these subjects also stands in relation to these conditions. The dual forms of the idiosyncrasies as considered above must be taken broadly. It may be that development defects have their primary origin in pathological processes of the various cerebral zones; besides, the former may manifest themselves in a manner quite similar to that characteristic of pathological idiosyncrasies, as is demonstrated. G. B. Pellizzi (Jour. of Ment. Pathol., Vol. iii, Nos. 4 and 5, 1903).

GROUP II. PSYCHOSES DUE TO VICIOUS OR ABNORMAL BRAIN-ORGANIZATION (ALWAYS HEREDITARY).

Paranoia.

Definition.—A chronic, inherited, incurable form of insanity, generally progressive, characterized principally by hallucinations and persistent delusions, and rarely terminating in dementia.

The literal meaning of the term *paranoia* is a dislocation or displacement of the mind; the German term is *Verrückt-heit*. In most cases the intellectual powers are preserved and the affected person may reason with much correctness. His conclusions follow logically upon his premises, but as these are wrong the conclusions are likely to be false. The milder forms are generally known as cranks. It has become the fashion to call these persons degenerates, and to class them with geniuses, criminals, saints, musicians, artists, and anarchists. Obviously such a heterogeneous commingling of discordant elements fails to make clear to the ordinary mind what a crank or paranoiac really is.

Development.—The person burdened with an inherited neuropathic tendency usually shows psychical evidences of it in early life. There is in childhood eccentricity, abnormal reserve, morbid pride, at times uncontrollable anger; the

child is peculiar, is not like other children. At an early age there may be already evidences that the child regards itself as ill-treated by parents or others; its merits are minimized, its faults exaggerated. The other children in the family always get more than their share of praise. This morbid sensitiveness, usually baseless, is often accompanied by excessive precocity. Prizes are gained in school which are, however, generally regarded as entirely inadequate rewards for the tasks accomplished.

After puberty generally, sometimes not until after middle life, the excentricities of behavior become more marked. The subject cannot live in peace and amity with anyone for a long time; he develops hallucinations and delusions. These are generally present at some stage of the disease, although its development may stop short of their production.

The hallucinations and delusions dominate the thought and conduct of the subject. As Krafft-Ebing says: "The paranoiac feels and acts as if his delusions were true."

From the twentieth to the fortieth years the excentricities, hallucinations, and delusions either gradually or by sudden accessions become more marked. The delusions become systematized, as it is termed. That is to say, the delusions assume a regular character, not varying except in increasing intensity and greater specialization. Thus, a subject, fancying himself persecuted by the world in general, will gradually pick out a person whom he regards as his especial persecutor, to whom, or to whose machinations he ascribes all his misfortunes, real or imagined.

When is it justifiable to deny the competency of paranoiacs? As far as the law is concerned it makes little difference regarding the value of a will if it is proved that on one particular the

patient was insane. In the interest of these persons and also in the interest of society, they should be declared incompetent to make a legal will as soon as the danger of an irrational comprehension of conditions arises as a result of the disease. There is no doubt that there are paranoiacs who regard the world with a diseased aspect, and who are, nevertheless, practically not impaired as members of society. K. Heilbronner (Münch. med. Wochen., Apr. 7, 1903).

Symptoms. — **HALLUCINATIONS.** — Among hallucinations, those of hearing are most frequent and annoying. They may be simply disturbing noises, but are usually recognized as distinct voices often attributed to particular persons. Rarely the character of the hallucinations is pleasant and agreeable; much more frequently they are irritating. Thus, in the most frequent form of the auditory hallucinations the subject hears persons accuse him of dishonesty or other improper practices, persons call him opprobrious names, or he hears conversations which reflect upon him in various ways. Under the influence of these hallucinations the patient may make complaint to the suspected person, or invoke the aid of the law to right what the patient considers wrongs done him. When these measures fail, the patient may take the law into his own hands and endeavor to right the wrongs himself.

[Thus, a young man of fair education, and who was in all respects an excellent clerk, fancied he heard his employer reflect upon his honesty. He complained to the employer of the supposed injustice and was informed that he was entirely mistaken and that, on the contrary, his services were very satisfactory. This quieted him for a time, when the voices returned. He then resigned his position and spent his time at his home brooding over his troubles. In the meantime the hallucinations continuing, he purchased a revolver and spoke to some members of his family of the persecutions to which

he was subjected to by his former employer. A sexual tendency was manifest in the hallucinations, although the behavior of the patient was unexceptionable. Male attendants in the hospital, and sometimes visitors, would shout obscene remarks at her during the night. These were usually attributed to the most circumspect persons. On one occasion a high ecclesiastical dignitary visited the hospital, and a few days later the patient complained that she had been compelled to endure his presence and embraces during the previous night. Similar complaints, with no more reason, were made against some of the attendants. She imagined a machine by which obscene pictures were thrown on the walls of her room during the night which she was compelled to look at. These frequently kept her awake, she averred, during the greater part of the night. At table some of the attendants delighted in throwing a stream of putrid sewage from a hose between her plate and her mouth, so that she was prevented from eating. The latter behavior, which she regarded as particularly atrocious, was generally attributed to the women nurses in her ward. In other respects she was an extremely well conducted patient, an exceptionally good and industrious seamstress, and painfully neat and clean about her person, clothing, and room.

GEORGE H. ROHE.]

Hallucinations of vision are often of a pleasurable character. The visions, so graphically described by Du Maurier in the novel before mentioned are examples. On the other hand, the visions may be disturbing or terrifying and aid in the genesis of delusions of suspicion or persecution.

DELUSIONS.—Delusions are usually evolved out of hallucinations, although they may originate independently of these. In paranoia the characteristic delusions are those of persecution, combined with delusions of grandeur. There are also delusions of personality, where the subject fancies himself another person,—usually one belonging to a higher

social caste. Among the delusions becoming rather frequent at the present time are those of electrical and hypnotic influence and of thought reading. The electrical delusions are sometimes very complicated. The patient is controlled by a dynamo, or some modification of the telephone, which is in the office of the chief of police of the city. Through this the patient is annoyed by the police, the detectives, or corrupt politicians, whose names are mentioned by the patient with great freedom. When the patient wants to bring his complaints before the proper authority, the persecutor brings the machine into play and confuses the patient's mind or words to the extent that he cannot make an intelligent verbal complaint. He usually gives his complaint very extensively and often connectedly in writing. The electrical or hypnotic apparatus is also used to deprive the patient of sexual power, or to compel him to masturbation, which he regards as an attack upon his self-respect. If one does not believe his words it is easy to prove it absolutely by a galvanometer which if attached to his head will show the presence of an electric current. A similar machine,—the description given is usually very vague,—is used to detect the patient's thoughts, and so get him into trouble.

[One patient, a woman, who was very much disturbed by the use of such a machine by the writer, invented one to counteract the influence of the first. Of course, the machine was never actually constructed; it existed only in the patient's mind. GEORGE H. ROHE.]

Under the influence of delusions of persecution, the patients themselves become persecutors: the *persécuteurs persécutés* of French authors. To this class belonged Guiteau and Prendergast, the assassins of President Garfield and Mayor Carter Harrison, whose history is so re-

cent that no detailed reference is here needed.

The delusions of grandeur may be present with or without hallucinations. They are usually combined with delusions of persecution, although these may be in temporary abeyance. Thus, the asylum princes, saints, great generals, or even deities, while protesting their high estate, lament the fact that through the villany of others they are deprived of their just rights. These persons are also dangerous, because they sometimes seek to obtain by force the honors of which the world has robbed them.

In the early stages of paranoiac disease the delusions relate to some encroachments upon the life, health, honor, or property of the patient. Such patients are usually self-centered, and from childhood have been reserved, suspicious, and often hypochondriacal. They are generally badly developed, and have the more common stigmata of degeneracy: as a want of symmetry of both sides of the face, a lack of development of facial bones, giving rise to the protruding chin and "whopper" jaw so characteristic of the descendants of the Emperor Charles V, or asymmetrical palpebral fissures. They are generally unduly responsive to all external disturbing influences, and the development of morbid characteristics may follow comparatively slight disturbing causes. Paranoia develops as an unmistakable disease when hallucinations of the special senses give rise to actual delusions. The delusions are at first, and often for many years, those of persecution, and their character is determined by their habits of life, system of beliefs, and above all by their antecedent mental development or education. They believe the world to be generally unfriendly to them and seclude themselves from their fellows.

Sooner or later, however, they are forced by vividness of their hallucinations to defy their enemies, and then develop dangerous tendencies. Most of the crimes committed by the paranoiacs are done at this stage of their disease. The

terminal state of paranoia is what has been happily termed by one writer the stage of transformation by which through a further elaboration of his delusions the patient finally believes he has solved the terrible secret which has hitherto clouded his whole life. He begins to believe that he is persecuted because he is a superior being, and delusions of grandeur, power, and importance replace those of persecution; so that, though he may suffer, still he rejoices more than he suffers.

Every case of developed paranoia should be under custody and control until such time as the stage of transformation occurs. Henry M. Hurd (Nashville Jour. of Med. and Surg., May, '96).

Diagnosis.—The history of a neuro-pathic ancestry, the slow development, the persistent character of hallucinations and delusions, with the comparatively slight degree and late appearance of dementia differentiate paranoia from other forms of insanity. At times moderate grades of imbecility may simulate paranoia, but careful observation for a time will usually permit a definite diagnosis.

Four cases of chronic paranoia, showing degeneration of posterior cords of spinal marrow. Alterations of spinal cord in relation with psychical troubles of paranoia. Bernhard Feist (Virchow's Archiv, B. 138, H. 3, '95).

Prognosis.—As stated in the definition, paranoia is incurable. Krafft-Ebing says that in over one thousand cases under personal observation not a single recovery resulted. Remissions, and prolonged intermissions for a year or more may occur. These may be true lucid intervals with disappearance of all symptoms, but should not be regarded as permanent recoveries.

The duration of life is not shortened by paranoia. Dementia is not likely to occur until late stages, and then usually only to a moderate degree. Slightly marked weak-mindedness is, however, not unusual.

Treatment.—The paranoiac is always potentially a dangerous character, and hence requires to be kept under observation when the diagnosis is established. The restriction of a person's liberty is not to be lightly advised, but the advice is rarely improper in this form of insanity. The paranoiac is usually much better in an institution for the insane than when at large. His hallucinations and delusions become less disturbing, and he is largely deprived of the power of mischief. There are no "harmless cranks." They may be too cowardly to commit overt acts, but the fact that most of these characters when admitted to hospitals are armed with loaded revolvers or other concealed weapons is an indication of the trend of their thoughts. In all cases of paranoia the patient should be placed under strict observation and control. There is no other safe treatment.

The paranoiac is a menace to society and should be sequestered. C. B. Burr (Medicine, Nov., '95).

Recurrent Insanity.

Definition.—Recurrent or periodic insanity appears as states of exaltation (mania), depression (melancholia), or an alternation of the two (circular insanity), with intervals of apparent lucidity. Periodic dipsomania is one form of recurrent insanity. The tendency to recur persists throughout life, and dementia is rare.

Recurrent Mania.—**SYMPTOMS.**—The essential feature of recurrent mania is the occurrence of exaltation of feelings without confusion of ideas. The usual symptoms of mania (*q. v.*) probably dependent upon cerebral hyperæmia come on often without any prodromic symptoms of depression. After a month or longer in the exalted stage, the patient gradually, sometimes suddenly, returns to his normal mental condition, which, however, is not to be mistaken for recovery. The

victim of periodic insanity exhibits even in the intervals evidences of some involvement of the intellectual functions. The inherited tendency to mental disturbance is always discoverable.

[I recall a well marked case in a physician of about 55 years of age. He had been insane five or six times before. The first symptoms of an attack were neglect of his patients and an exceptional interest in the religious life of his neighbors. He talked religion and dialectics to anyone who would listen to him. As the malady advanced he began to regard himself as a fountain of medical knowledge, capable of filling any chair in any college to which he might be called. He had proposed himself for any vacancy that might occur in one of the medical colleges of Baltimore. The branch to be taught did not matter to him; he was equally competent in all. GEORGE H. ROHE.]

During the attack there is usually some loss of weight. The first attack most frequently occurs at puberty. In women succeeding attacks often coincide with the menstrual period.

Psychical integrity of women during their menses is a question most useful to consider in legal medicine. It appears expedient to find out if the crime committed by the prisoner coincided with her menstrual period. Under the term "period" is included not only the days during which the blood comes away, but those that precede and follow it.

An examination of the mental condition should be advised when the criminal act coincides with this period. This examination is indispensable when the history of the patient reveals a neuropathic taint or the existence of mental trouble during former menstrual periods, or when the act itself discloses peculiar changes.

When it is evident that the menstrual process exercised a powerful influence on the mental life of subject, she should have the benefit of this fact, even if no menstrual insanity can be made out in what concerns the application of the law

in the given case. Krafft-Ebing (*Jahrbuch für Psych.*, vol. x; *Annals of Gyn. and Pæd.*, June, '94).

PROGNOSIS.—Permanent restoration of normal mental function does not occur. Individual attacks are, however, recovered from and the patient remains apparently well until the next outbreak. The intervals between attacks may be weeks, months, or years. In one case now under observation the intervals are about two weeks.

Dementia is rare.

TREATMENT.—Chloral and bromide of potassium may be given to depress the circulation and cerebral exaltation. Krafft-Ebing recommends large doses of morphine at the beginning of the attack. In my hands sulphonal has given the best results. Fifteen to 20 grains are given every four hours and the quantity rapidly reduced as the maniacal condition passes away. In most cases the drug can be reduced to 5 or even 3 grains at a dose in the course of three or four days. The effects of the remedy upon the kidneys should be carefully watched. Bed-rest, baths, and good feeding are essentials in the treatment equally as important as medicinal agents.

Recurrent Melancholia.—The symptoms are usually those of simple melancholia without delusions; the attacks come on rapidly, and after a duration of some weeks or months disappear as quickly. Here is profound depression, loss of appetite, headache, and insomnia.

PROGNOSIS.—Favorable, so far as the individual attacks are concerned, but permanent recovery does not occur.

TREATMENT.—The favorable effects of opium as manifested in ordinary melancholia are not so pronounced in the recurrent variety. Krafft-Ebing recommends the following for its ameliorating effects:—

℞ Sodii bromidi, ʒiiss.

Antipyrini, gr. xlv.

Codeini hydrochlorat., gr. v.

Aquæ destill., ʒiv.

Syr. menthæ pip., ʒv.

M. Sig.: One teaspoonful, gradually increased to 7 teaspoonfuls as required, twice a day.

Circular Insanity (Alternating Insanity).

DEFINITION.—A form of insanity in which states of mania and melancholia alternate with each other with or without lucid intervals intervening.

SYMPTOMS.—The disease may begin with mania or melancholia. The initial mental disturbance, of variable duration, is followed, either directly or after a lucid interval, by the opposite condition. The duration of the cycle may be weeks, months, or years. In some cases there are marked delusions. The maniacal stage is usually one of simple exaltation.

DIAGNOSIS.—This is only possible after prolonged observation or when a trustworthy history of previous attacks can be obtained. Cases with lucid intervals between the stages of depression and exaltation are rare.

PROGNOSIS.—This is unfavorable. The duration of the disease is for life. Dementia does not occur except in advanced stages. The exhaustion of the maniacal stage may shorten life.

TREATMENT.—The treatment is unsatisfactory. Chloral fails to quiet the exaltation and restlessness in the maniacal stage unless given in such doses as to be dangerous. In like manner, opium is usually of little benefit during the stage of depression. When possible, rest in bed should be enforced, especially in the stage of excitement.

Dipsomania.—**DEFINITION.**—A morbid irresistible desire for intoxicating liquors.

Ordinary indulgence in alcoholic liquors must not be considered as dipsomania; neither are the various forms of drug-habit to be grouped with it. These habits are formed by repeated indulgence, which in the early stages can be avoided by the exercise of a little restraint. In dipsomania, on the other hand, the impulse that drives the subject to drink is due to an inherited neuropathic tendency which is too strong to be resisted when the opportunity to indulgence offers.

PROGNOSIS.—The prognosis of these cases is unfavorable. While drunkards may reform and opium and cocaine *habitues* relinquish their stimulus, the dipsomaniac is never cured of his morbid appetite.

TREATMENT.—This can only be symptomatic. Seclusion, withdrawal of alcohol, and in the event of delirium tremens, hypnotics, bed-rest, and food comprise the resources at command. (See **ALCOHOLISM**, volume i.)

Psychoneuroses.—It is probable that the brain-organization in hereditary hysteria, hystero-epilepsy, and epilepsy is also primarily defective. The ultimate mental weakness in these states is, however, a form of secondary dementia, probably due to the repeated physical shocks to which the brain is subjected in the nervous explosions characterizing hysteria and epilepsy.

GROUP III. PSYCHOSES DUE TO SIMPLE DISTURBANCE OF NUTRITION (ANÆMIA AND HYPERÆMIA) OF THE BRAIN.

Melancholia.

Definition.—Melancholia is a form of mental disturbance characterized by profound mental depression with suicidal tendencies. Its physical basis is supposed to be anæmia of the brain.

Symptoms.—The symptoms of melancholia are physical and mental.

First in importance are those referable to the digestive organs. There is nearly always profound anorexia, often resulting in obstinate refusal to take food. This may be due to gastric disturbance, but is more frequently the consequence of visceral hallucinations and delusions which will be referred to later. The tongue is usually coated and the breath offensive. Constipation is nearly always present.

Involuntary defecation is frequent, not because the patient has lost control over the sphincters, but on account of inattention to the sense of fullness in the rectum.

In women there is usually arrest of menstruation. The urine is generally somewhat diminished in quantity and rich in phosphates.

Urine of melancholics is much more toxic than normal urine; that of maniacs is less toxic. Brugia (*Jour. de Méd.*, Feb. 12, '93).

The toxicity of the urine was found to be diminished in maniacal states and augmented in melancholia. The urine of maniacal patients, when injected into animals produces excitation and convulsions; that of melancholic patients, restlessness, dejection, and stupor. There is often in insanity, as in eclampsia, an inverse relation between the toxicity of the urine and that of the blood, the latter being hypotoxic when the urine is hyper-toxic and *vice versa*. Régis (*Le Bull. Méd.*, Aug. 6, '93).

Sexual desire is usually diminished.

In nearly all, perhaps in all, cases of melancholia there is depression of nutrition. The red blood-corpuscles and the percentage of hæmoglobin are reduced.

Results of examination of the blood in fifty-two patients. In mania the corpuscles and hæmoglobin were normal or in excess in nearly all cases. In melancholia the hæmoglobin was deficient in

all examined, and the corpuscles below normal in 50 per cent. In paresis and dementia, corpuscles and hæmoglobin were deficient. In paranoia the corpuscles were much above the normal, while the hæmoglobin was only slightly below. J. A. Houston (Boston Med. and Surg. Jour., Jan. 18, '94).

There is usually considerable loss of weight. The skin is usually dry and harsh.

The force of the circulation is diminished. There is usually passive congestion of the blood-vessels.

The blood-pressure varies in different forms of insanity; it is raised in persons who are depressed and who are suffering from melancholia; it varies in cases of so-called agitated melancholia; it is normal upon the recovery of a patient whose blood-pressure has been raised during the period of depression; it is lowered in persons suffering from excitement or acute mania; it is normal after the excitement has passed off and the patient has recovered; it tends to fall as the day advances, causing melancholiacs to be brighter and excited patients to become more excited; the depression following upon an attack of acute mania is not necessarily an active depression, but rather more exhaustive in type, and the blood-pressure in these cases may remain low until it finally returns to normal upon recovery; the blood-pressure is probably raised in stupor; it is not always altered in delusional insanity except when there is also some emotional disturbance; in healthy, active, and excitable persons it is low as compared with healthy apathetic individuals; the blood-pressure is raised in general paralysis of the insane when there is depression, while in the excited types of this disease it is low, as it is also in the later stages of all types; the feeling of weight and pressure upon the top of the head is apparently vascular in origin, and is lessened or disappears when the blood-pressure is lowered. Maurice Craig (Lancet, June 25, '98).

Melancholiacs suffer from paralysis and rigidity of the spinal column and of the large proximal joints, the movement

of the small joints being unimpaired. In mania, on the other hand, there is overstimulation and irritation, and characteristic movements occur at the large proximal joints. The melancholiac shakes hands from the wrist, the maniac from the shoulder. If it is accepted that insanity is due to nutritional disturbance of the cortical neurones, the following conclusions may be formed: (1) That in mania an irritating product is formed within the cortical neurones—such a view being supported by the frequency of hallucinations in mania; (2) that in melancholia a paralyzing product is formed within the cortical neurones; (3) that in agitated melancholia there is a combination of deleterious influences—viz., a paralyzing product within the cortical neurones and also an irritating body in the plasma which bathes the nerve cell; and (4) that in a few cases of mania there is in addition to the irritating body within the nerve cell an irritating body within the plasma which bathes the nerve cell.

When it is realized that melancholia is a special form of paralysis, it is easy to see that many of the more common delusions of melancholiacs arise from the feeling of inactivity. The delusions of exaltation of the maniac arise in a corresponding manner from the feeling of activity, which arises from the stimulation of his cortical neurones. Stodart (Lancet, Mar. 5, 1904).

MENTAL SYMPTOMS.—The mental symptoms of melancholia are depression, hallucinations and illusions, delusions, fear of death, and tendency to suicide. The last-named is potentially present in all cases, but is active in many.

In simple melancholia there is profound depression, with a fear of never recovering either physical or mental health. In these cases the memory and judgment are usually preserved, but the patient is so entirely under the control of the depressive emotion that he cannot think normally.

In melancholia with delusions, the latter are usually those of self-accusa-

tion, self-abasement, or of justifiable persecution. The melancholiac feels that he is justly punished by God for some transgression, real or imagined. Indeed, he fancies usually that his punishment is entirely inadequate to the transgression.

The melancholiac seeks death either because he thinks he merits it, or—and this is perhaps more frequently the case—to escape from mental distress, which becomes unbearable.

One of the most persistent delusions of melancholia is that there is destruction of the abdominal viscera and that no food can pass; that, if taken it will not pass and that it will cause the patient's death if forced upon him. The complaints of being "rotten inside" are frequent among melancholiacs. The physical demonstration of eating a meal, of living through it and maintaining the strength, and of the regular continuance of defecation has no effect upon the delusion. It persists in spite of the constant contradictions which the patient himself furnishes. On the other hand, it must be borne in mind that the sensations of obstruction may be real, and that an actual stenosis of the bowel may be present. Such cases have been reported by Clouston and by me.

The delusion that the patient has committed "the unpardonable sin" or "the sin against the Holy Ghost" is an extremely obstinate one. Savage regards this delusion as an unfavorable one, as patients manifesting it—"the unpardonable sinners," as he calls them—rarely recover. The nature of the unpardonable sin varies with different persons. Most of them cannot or will not define it.

In some cases the fear of impending death colors all thoughts and actions of the patient. Food and medicine are refused, because the patient will presently

die. Nothing can be done to prevent it. In other cases all friends have deserted the patient, and there is nothing left but to die.

Most melancholiacs are more or less passive and quiet; beyond making verbal complaints of their sufferings they sit and brood over their troubles, which are always real to them. In other cases, however, there is great restlessness. The patients are constantly in motion, crying and lamenting, sometimes under the stress of their delusions there are outbreaks of violence, although these are rare.

The suicidal tendency is present in a large proportion of melancholiacs. Life is usually taken by violent means. Hanging, shooting, jumping from a height, cutting the throat, and drowning, are the most frequent methods. Even such painful methods as burning, and swallowing broken glass are resorted to. The attempts are sometimes very persistent.

Sometimes melancholia is combined with a stuporose condition,—“melancholia with stupor.” In these cases the patient sits or stands all day long, mute, apparently taking no note of anything going on around him. There is sometimes also resistance to everything done for the patient. Some authors class the affection described by Kahlbaum under the name *catatonia* with stuporose melancholia, but in my opinion, *catatonia* belongs to the group of which general paresis is the type.

Causation.—Anything that depresses the general nutrition in one predisposed to insanity may cause melancholia. The essential physical substratum of the disease is probably cerebral anæmia, although at present the morbid anatomical condition of the brain in melancholia is not known.

Although melancholia may not be caused by an impoverishment of the

blood *per se*, such impoverishment almost invariably exists, and, in a large majority of cases, improvement of the mental symptoms is coincident with improvement in the general health and in the quality of the blood. Whitmore Steele (Amer. Jour. of Insanity, Apr., '93).

Analysis of 730 consecutive cases of melancholia admitted to the Carlisle Asylum during twenty-seven years. Taking the three grand groups of mental diseases,—melancholia, mania, and dementia,—melancholia formed a fraction over 25 per cent.,—334 males and 396 females; 58 per cent. were discharged recovered, 8 per cent. relieved, 4 per cent. unimproved, and 20 per cent. died; 219 were cases of simple melancholia and 511 melancholia with delusions; 65 per cent. had suicidal tendencies, self-destruction being actually attempted in 33 per cent.; in 29 per cent. some physical disease co-existed with the mental disorder. The physical diseases most frequently present were phthisis (70 cases), heart disease (57 cases), and cancer (10 cases). Two-thirds of the cases were between 30 and 60 years of age. The largest proportion of recoveries occurred between 10 and 30 years. The proportion of relapses was 22 per cent. Hereditary predisposition was ascertained in 38 per cent.

Leaving out of consideration hereditary predisposition and previous attacks, the cause of melancholia was found, in a marked preponderance of cases, to be of a physical nature. In over 400 of the 730 cases there was ascertained to be some such cause at work in originating the mental depression. Intemperance in drink was assigned as a cause in 84 cases, pregnancy in 7, parturition and the puerperal state in 20, lactation in 23, privation and starvation in 28, and in a large number of other cases there was some kind of physical disorder preceding the melancholia. In about 250 cases the mental depression was assigned to some moral cause. W. F. Farquharson (Jour. of Mental Sci., Jan., Apr., '94).

Three cases of well-marked melancholia apparently dependent upon local pelvic disease. These cases recovered, physically and mentally, after appropri-

ate local treatment. One of the cases had been insane four years, and had been nine months in an insane hospital. W. Gill Wylie (Med. Rec., Aug. 4, '94).

Case of melancholia in which the patient had for two years suffered from hallucinations of hearing. He became depressed, sleepless, and took to drink. The voices heard were those of friends far away, and they goaded him on to destroy himself in order to avoid disgrace.

He had constant headache on the left side, and had attempted to cut his throat.

Trephined, making a large opening over the centre for hearing, and found a serous cyst, which was drained. The patient completely recovered. Street and Damer Harrison (Liverpool Medico-Chirurgical Jour., July, '97).

Fifty cases of injury to the parietal tuberosity and its neighborhood collected which were severe enough to involve the brain and its membranes, and which were followed by melancholia. One-half of these were relieved by surgical operation. Melancholia is also the type of disease observed when tumors involve this region; it also occurs when the local lesions are inflammatory. Bernard Hollander (Jour. Mental Sci., July, 1901).

The stimuli which give rise to these painful sensations are found in tissue metabolism. Melancholia is pre-eminently an emotional disease, and the emotions arising are invariably of a painful character. Now, if it can be established that the metabolic process is answerable for the normal emotions, we may have here the foundation laid for the so-called abnormal emotions attendant upon melancholia. H. H. Stoner (Medical News, Aug. 17, 1901).

In about one-half of all cases there is a psychopathic ancestry.

Diagnosis.—In many forms of insanity psychological depression is a stage in the development of the disorder. Thus, mania mostly begins with depression; in general paresis, although the feelings are usually exalted, there may be a depressive stage

lasting nearly throughout the disease. Many cases of paranoia have a melancholy tinge, and in the toxic psychoses depression is not an unusual symptom. True melancholia must, however, be differentiated from these episodic depressions.

In true melancholia every emotion, thought, and act is dominated by the sense of profound depression. Nothing can dissipate the cloud of sadness that envelopes the patient. He is lost; there is neither relief for him in this world nor salvation in the next.

In catatonia there is rhythmical forms of movement and of speech alternate with rigidity and mutism. The rigidity affects mostly the muscles of the neck and shoulders. Attention drawn to the fact that rigidity of this nature is not confined to cases of catatonia. It also exists in all cases of melancholia to a greater or less degree; but it is especially marked in severe cases of the disease, and especially in those cases in which there is an element of stupor. It is most marked in the muscles of the trunk and neck; it is less marked, but very strikingly present, in the muscles of the shoulders and hips, and it is again less marked in the elbows than at the shoulders, less marked at the wrists than at the elbows, and it is practically absent from the fingers. Similarly the rigidity is less marked at the knees than at the hips, very slight at the ankles, and again practically absent from the toes.

Personal reasons for believing this proximal rigidity to be a true physical sign of melancholia are:—

1. That it does not occur in other forms of insanity.
2. That it disappears from the patient as he gets well.
3. That voluntary rigidity is of the peripheral type.

This is best observed in a resistant child.

Since rigidity is frequently associated with paralysis, one naturally endeavored to ascertain whether there was any weakness of movement at those joints

where the rigidity was most marked. This paralysis has been detected. There is very little weakness to be detected in the elbow- or wrist-movements, but, if such a patient be asked to hold his hands straight above his head, he has difficulty in doing so; and it will be observed in extreme cases that the upper arm is not nearly held vertically, and that the elbow is not quite fully extended.

This symptom seems most marked in those patients who suffer a large amount of mental pain, especially if associated with an element of stupor.

The conclusion is that in cases of melancholia the cells of the tissues throughout the body have their function of excretion diminished, as well as the cells of the cortex cerebri. W. H. B. Stoddart (*Journal of Mental Science*, Apr., '98).

The diagnostic criteria of incipient or simple melancholia may be reduced to the following clinical symptoms:—

1. Mental depression presenting all degrees of depressed states of feeling.
2. Insomnia, which may be slight or profound, but usually very persistent.
3. Headache or psychalgia, which is commonly referred to the occipital region.
4. Loss of normal body-weight, presenting all degrees.
5. Changes in attitude and physiognomy.
6. Impaired appetite with marked constipation.
7. Morbid introspection with selfish inclinations.
8. Morbid fear of objects or places constituting the phobias.

When these symptoms present themselves in any individual and become persistent, whether the cause be known or not, they constitute the actual presence of that form of incipient insanity known as simple melancholia. John Panton (*Alienist and Neurologist*, Oct., '98).

Diagnosis of melancholia of toxic origin: A blow or steady pressure across a muscle produces contraction, and a swelling persists for some time at the point of contact. This local contraction is exaggerated in fevers of a serious

nature, and immediately after death, when the contraction of the whole muscle is diminished. Out of 40 melancholic patients, the phenomenon was present in 32. The muscle selected was the biceps; this was seized firmly at about its middle part between the thumb and forefinger, stretched forcibly, then let go. The forms of melancholia in which it was observed were: Simple melancholia, 1 case; melancholia with stupor, 8 cases; melancholia with delusions, 16 cases; anxious melancholia, 3 cases; the depressed stage of folie circulaire, 3 cases. Vallon and Wahl (*Arch. de Neurol.*, May, 1900).

Prognosis.—This is generally favorable. Under appropriate treatment, from 75 to 80 per cent. of cases should recover.

Treatment.—One of the first questions usually asked the physician who is consulted in a case of mental disturbance is: can the patient be treated at home, or is removal to an institution necessary? In cases of melancholia home treatment is often practicable, if an attendant with tact and firmness is secured. Even under these favorable circumstances, however, treatment in an institution should be advised. Refusal of food and medicine must be met with positiveness, and in case of resistance forcible feeding must be practiced. It is rarely necessary to resort to the nasal or œsophageal tube, and, in those cases in which it must be employed, a few trials are usually sufficient and the patient will thereafter take his meals with a little coaxing. It is not sufficient to know that the patient eats; the physician must assure himself that the quantity of food is sufficient to maintain the standard of normal nutrition.

As refusal of food is sometimes due to gastric or intestinal disorders, the patient should always be carefully examined to determine whether the gastro-intestinal canal is in normal condition. Catarrhal conditions demand appropriate treatment, and want of digestive power may,

at times, be relieved by tonics, stimulants, and digestives. For brief periods, concentrated or partially digested foods, such as beef-juice, clam-juice, peptones, etc., may be employed with benefit.

Nux vomica or strychnine, quinine, phosphorus, or codliver-oil will often be found of use.

The systematic use of stomach-washing also promises good results in these cases.

There is usually constipation in melancholia. This should be counteracted by the nightly administration of compound licorice powder, cascara sagrada, or one of the usual anticonstipation pills. A mercurial followed by a saline purgative is good initiatory treatment, and a weekly repetition of the mercurial will be found beneficial.

Perhaps the most important remedy in acute melancholia is rest in bed. The depressed state of nutrition is a strong indication for bed-rest. It will be found that the patients quickly respond to the good effects of this treatment. Supervision of suicidal cases is also much easier if patients are kept in bed.

The production of sleep is most important. Depressing hypnotics, such as chloral, bromide of potassium, etc., are not beneficial. If an hypnotic is necessary, morphine, sulphonal, or paraldehyde should be used.

As trional may cause unpleasant effects in patients affected with heart disease, especially where there is defective compensation, it should be prescribed in such cases with the greatest caution. Keppers (*Thèse de Wurzburg*, '93).

Chlorobrom highly recommended in melancholia and brain-exhaustion from overwork, when insomnia is the most serious symptom to combat. Keay (*Lancet*, Mar. 18, '95).

Chlorobrom is most favorable in melancholia, especially of the milder type; and in acute mania its action is fully as

reliable and lasting as any other hypnotic we possess. Wade (Amer. Jour. of Insan., Apr., '95).

Case of acute melancholia in which the patient had attempted suicide, and who refused to lie down and sleep. A bottle containing an indifferent mixture labeled "laudanum" was left in her room; she immediately drank it, lay down, and slept several hours. J. M. Gibbons (Med. News, Sept. 30, '99).

Certain classes of mental and nervous agitation which appear to be particularly benefited by codeine. Codeine phosphate was the substance used, especially with good results, in melancholia with acute feelings of misery, epigastric pains, shallow respiration, feeble secretions, and general bodily depression. Careful observations were made of its effects on 15 patients, namely: 5 males, 4 single and 6 married women. The ages of the patients varied from nineteen to seventy-six years, the following being a few selected cases: Woman, aged 76 years, senile melancholia, treated with marked benefit; man, aged 50 years, melancholia with insomnia, much improved; man, aged 32 years, melancholia with self-accusations, great improvement; man, aged 26 years, melancholia with mutism and delusions of persecution, greatly improved; single woman, aged 29 years, with delusions of persecution, hallucinations of sight and hearing, zoöpsia, and hysteria, no effect; man, aged 21 years, hebephrenia (exaltation and mental confusion), with sexual excitement, no improvement. From careful analysis of the cases and results the following conclusions are drawn: (1) marked improvement follows the treatment with codeine phosphate when there is melancholia with anguish and great moral suffering (*douleur morale*), and corresponding disturbance of general sensibility; (2) such patients were rendered bright, cheerful, and happy, and sleep was obtained; (3) the action of codeine on the bowels was not nearly so constipating as opium or morphine, while the respirations were increased in depth; (4) the dose of the codeine phosphate was 4 to 6 centigrammes ($\frac{3}{8}$ to 1 grain)

hypodermically, or 6 to 8 centigrammes (1 to 1 $\frac{1}{2}$ grains) by the mouth (excessive dosage produced headache, nausea, vertigo, tachycardia, and myosis of the pupils); (5) the drug was contra-indicated in all cases of intense excitement, including simple mania, as it increased such disorders. Jules Clausse (Thèse de Paris, 1902; Brit. Med. Jour., June 21, 1902).

A pint of ale or beer, or a glass of whisky and water is often a better hypnotic than the medicines mentioned.

The tendency to suicide in melancholia requires careful and constant watchfulness. The patients with suicidal tendencies often display great shrewdness in lulling the suspicions of those having them in charge. The most attentive and watchful nurses are liable to relax their care, and, before preventive measures can be adopted, the patient has secured a weapon and taken his life. The attendant upon a melancholiac must have an intelligent appreciation of the patient's condition and of the persistence of suicidal impulses.

A patient with melancholia, especially the agitated and the stuporous forms, should never be left alone night or day. The danger of suicide is always present and is often a matter of sudden impulse, peculiarly liable to develop if the patient is alone. The diet should be nutritious and quite sufficient. A low diet, so-called, is rarely, if ever, indicated. Pritchard (N. Y. Polyclinic, Mar., '96).

The medicinal agent of most value is opium. Many alienists object to its use on account of the alleged danger of contracting the opium habit, but when the drug is disguised and is systematically administered, this danger can be guarded against. It is best given in the form of deodorized tincture diluted with whisky and combined with a laxative, as cascara, to diminish the constipating effects of the remedy. The latter, however, are not very marked after the medicine has been

taken a few days. The beginning dose is 5 minims of the deodorized tincture, gradually increased to 30 or even 40 minims twice a day. Stress is laid on the regular administration of the drug. When opium or morphine are given at regular times to reduce anxiety or produce sleep, it fails entirely in producing its beneficial curative effect in melancholia. When the desired effects (quiet, diminution of intensity of hallucinations and delusions, disappearance of mental depression) have been obtained, the dose is gradually reduced to the vanishing-point.

In some cases the opium produces so much gastric irritability that it must be suspended. These are, however, very few.

Results of personal observations upon the use of opium in the treatment of melancholia summarized as follows: 1. Rest in bed for a prolonged period. 2. Every morning the patient is given on waking a glass of Hunyadi water, preventing in this way the disturbing effects of constipation. 3. Tincture of nuxvomica is given in small doses twice daily before the two principal meals of the day. 4. Laudanum is used in progressive doses, commencing with 5 drops and increasing 5 drops each day until distinct improvement in the patient's condition is observed. The writers have never had occasion to exceed 200 drops daily.

After there has been a marked improvement observed in the physical condition spray-baths of short duration are employed. Bell and Lemoine (*Annales Médico-psychol.*, Jan., Mar., '89.)

Systematic observation extending over two years, and embracing the employment of over 18,000 single doses of opium in the treatment of various forms of mental disturbance. The treatment embraced over 40 cases of melancholia, 4 of typical mania, and 50 of various forms of paranoia. Of the 43 patients of melancholia, 2 died of intercurrent diseases, 2 were removed by relatives, and 31 recovered. Although this success certainly

cannot be wholly due to opium, as good food, rest in bed, etc., had a great share in producing the favorable results, still the beneficial effects of the opium cannot be denied. In those cases which did not improve under the use of opium, 6 were afflicted with a marked delusional state, with excessive mental disturbance. The opium was wholly given by the mouth, and the constipation, which was observed in about 50 per cent. of the cases, was successfully relieved by the fluid extract of cascara sagrada, and the diarrhoea, which was observed at the height of the treatment and at the suspension of the opium, by tincture of koto, 10 to 20 drops. It would be perfectly justifiable to continue the use of the opium for at least a year, if it could be shown that the intellect was not being impaired by its employment. In mania the bromides and hyoscyne can be used to better advantage. Theodore Ziehen (*Therap. Monats.*, Feb., Mar., '89).

In considering the usefulness of any particular line of treatment in melancholia, due weight must be given to the tendency of this disease to recovery in the great majority of cases.

Taking then the indication suggested by the age of the patient for or against the use of opium, patients of fifty years of age and over react most strikingly to its employment, and rapidly improve under its use. On the other hand, patients of about thirty years of age and under are made notably worse by it. Those between the ages of fifty and thirty react uncertainly to opium; and where such cases do improve the progress toward recovery is much slower than in older patients. It does not appear that the form in which opium is given is of much importance.

The dose should always be rapidly pushed to the limits of tolerance; and also continued sufficiently long to give it a fair trial.

In looking for a substitute for opium in cases of melancholia in the first half of life, no drug has given such good results as sulphonal. Given in average doses of 30 grains each night it speedily acts not only by inducing sound and refreshing sleep, but also by what might be called its after-effects: it makes a

patient rather heavy during the day following its administration. This is an advantage; there seems to be mental suffering, and suicidal tendencies and obstinate refusal of food are often relieved. This after-effect of sulphonal must be reached by increasing the dose with caution if necessary, and maintaining it for a few days in the full amount, then gradually reducing it, and only increasing again if there is any threatening of a relapse.

It has not been found necessary to give a larger quantity than 30 grains; they always begin with this dose, and never give it more frequently than every night. J. R. Gasquet and J. A. Cones (*Journal of Mental Science*, July, '97).

Melancholia with anxiety, due in great part to vasomotor disturbances, is greatly benefited by nitroglycerin and sodium iodide given as follows:—

R Spirit of nitroglycerin, 30 drops.
Water, 10 fluidounces.

One tablespoonful twice a day.

This is given for the first ten days of each month, and the other twenty days the following mixture is administered:—

R Sodium iodide, 2½ drachms.
Water, 10 fluidounces.

Tablespoonful twice a day.

To counteract the destructive action of the iodine on the blood-corpuscles, glycerophosphates and strychnine arsenate are given hypodermically. Paoli (*Riforma Medica*, 1900).

An important thing in all cases of melancholia, as in other forms of insanity, is a careful examination of all the bodily organs, and the treatment of such as are diseased.

Mania.

Definition.—An abnormal exaltation of mental activity, with incoherence, hallucinations, illusions, and delusions of variable character. There is reason to believe that mania is accompanied by an hyperæmia of the cerebral cortex.

These symptoms may all occur as a stage in some other form of mental dis-

turbance. Thus, paranoia, general paresis, gross brain disease, and developmental psychoses may have maniacal attacks as part of the clinical history. In true, uncomplicated mania the exaltation is the characteristic manifestation.

Symptoms and Course.—An outbreak of mania is usually preceded by some days or weeks of depression or irritability of the patient. He loses appetite, the sleep becomes disturbed, and there is observed a disinclination to his usual occupation. Sometimes there is headache, or a sense of pressure in the head. These symptoms, after a time, become changed in character. The depression disappears, the patient feels exalted and becomes talkative. If asked about his health, he will tell you he is well—"never felt better in his life," etc. Schemes for his own advancement or that of others are regarded in an optimistic spirit. Visits are made to friends and acquaintances and private business affairs are discussed with more prolixity and less reserve than are usually agreeable to others concerned. The recollection of past events is sometimes very accurate and the minutest and least important details of some long past transaction are often recounted in the most wearying manner for the hearer. The patient in this stage does not care whether you reply to him or not. He only wants a good listener into whose ears he can pour his connected or disjointed verbosity. He also usually becomes a voluminous letter-writer. In some cases there is a tendency to make rhymes which are sometimes very ingenious. This must be differentiated from the verbigeration or chattering of delirium or of acute confusional insanity.

The persistence of hallucinations and delusions in melancholia and paranoia is usually absent in mania. In this form of mental disturbance there is usually rapid

change of delusions and hallucinations, often without apparent cause. The false sense-perceptions and ideas vary as rapidly as they sometimes do in dreams.

If unopposed in his irrational notions, the patient is usually in a cheerful, even happy frame of mind. Contradiction or opposition soon lead to irritability, and at times the patient may become so angry as to be uncontrollable. Under these circumstances maniacs may commit acts of violence, the patient's anger being entirely beyond his control. On the other hand, if the delusions are encouraged they "increase by what they feed on" and grow more persistent and insistent.

In connection with the mental exaltation there is often great restlessness. The patient may continue doing his usual work, but he does everything in a hurry. There is a more lively play of the facial expression. The patient frequently poses for effect. This is perhaps equally frequent in the two sexes, although more marked in women. Sexual desire is also enhanced, and, in advanced stages women are likely to exceed males in obscenity of speech and action. Masturbation is sometimes observed in mania, but much less frequently than in epileptic insanity. The open practice of the vice is comparatively rare.

In the more severe forms of mania all these manifestations are intensified. The rapid movements, the shouting and laughing, incoherence, obscenity, and profanity are greatly heightened in degree.

Articles of clothing, bedding, furniture, in short, anything that offers opportunity for tearing or breaking are liable to suffer destruction at the hands of the maniacal patient. He loses control over his sphincters, and wets and soils his bed and clothing, or defecates on the floor

and then dabs his body or the walls of his room with his excreta. There seems to be anæsthesia in some cases; at all events slight injuries, that in the normal condition would give rise to complaints of pain, are either not felt or are thought unworthy of notice.

Fever is present in a considerable proportion of cases of acute mania. It should always lead to a careful physical examination to determine the presence of any local inflammatory condition. In two recent cases under notice the fever was due to considerable collections of pus. In one of these no pain was complained of; and yet on examination a large perirectal abscess was discovered which discharged about ten ounces of pus when opened. Mere functional derangement of the mind is not likely to cause appreciable elevation of temperature. There can nearly always be found some direct cause for the fever, either inflammatory or septic. The inflammation may be in the brain or its membranes, in the abdominal viscera, the pelvis, the external ear, the integumentary tissues, or the peripheral nervous system (neuritis). The septic infection may start from a wound, an abscess, or a diphtheritic patch, or it may be in the blood itself, as in various specific febrile conditions. Even when no physical cause can be discovered, fever is always a grave symptom, since, if it rises too high, exhaustion supervenes more rapidly.

The pulse in mania is usually full and regular. But when there is beginning exhaustion, as in those cases where the patient is constantly moving about, with insufficient food and sleep, the pulse is small and rapid. In these cases death from exhaustion is not infrequent.

An attack of mania may terminate in one of four different ways: (1) recovery;

(2) death from exhaustion; (3) chronic mania; (4) consecutive dementia.

Diagnosis.—The diagnosis of the clinical form of mental disturbance termed mania is sometimes rather difficult. As before stated, many forms of insanity have a maniacal stadium which may be, and often is, mistaken for a special disease. Hence prolonged observation, extended over days and sometimes weeks, is, at times, necessary to form a positive judgment. The greatest difficulty occurs in those cases due to septic or toxic causes which by many are not differentiated from true mania. In these cases the exaltation is often only apparent, the essential and characteristic manifestations being mental confusion or delirium.

The terms "acute confusional insanity," "acute delirious mania," etc., show that observers generally recognize a difference between these cases and those of simple mania. In the latter the essential manifestations are the exaltation, flight of ideas, and rapidly changing hallucinations and delusions.

Acute delirium and acute mania are frequently mistaken for each other, and their diagnosis from each other is somewhat difficult to make. The temperature is elevated in acute delirium, and lowered in mania. The exhaustion is very rapid in acute delirium, while the maniac will continue to rave for months with little perceptible loss of strength. Mania is a conscious delirium, the patient being aware of what he is doing and taking every advantage of others; acute delirium is an unconscious delirium, the patient never trying to take any advantage, and, although he recognizes people, five minutes later he does not remember to have spoken to them. In mania the appetite is often enormous; in acute delirium it is always absent. Mania is preceded by marked prodromata; the prodromata of acute delirium are never very marked and are often absent. In mania the face is often flushed and the sclerotic injected; in

acute delirium the face is pallid and there is no injection of the sclerotic. Acute delirium will terminate in death or recovery in two or three weeks; mania will require months. Coston (Nashville Jour. Med. and Surg., Aug., '96).

Causation.—Aside from the influence of heredity, which can be traced in one-half or more of the cases, prolonged excitement of the cerebral centres, overwork, and mental strain of various kinds may be regarded as etiological factors.

The infectious origin of acute delirium shown in eight cases, in seven cases of which recovery or considerable improvement took place, eighth ending fatally. In the latter only did the blood reveal presence of bacilli. Bianchi and Piccino (Jour. of Nerv. and Mental Dis., Aug., '95).

All forms of acute delirious mania are of toxic origin, some being caused by the introduction of a poison from without, others by the absorption of septic material, while a third class is due to auto-intoxication. As regards the action of a possible poison on the nerve-cell and its functions, the subject is too speculative for any advantage to be derived from discussing it. In cases with high delirium, and a rapidly fatal termination, there is generally a condition present in which all the giant cells are profoundly altered, and probably the inspection of a section in such cases would furnish a tolerably accurate diagnosis of the mental state preceding death. John Turner (Brit. Med. Jour., Sept. 22, 1900).

The bacteriology of acute delirious mania. In 1881 Briand discovered micro-organisms in considerable quantity in the urine. In 1884 Rezzonico found emboli of micrococci in the cerebral blood-vessels. Bianchi and Piccinino found bacilli in the blood of 2 cases, and these observers were able to isolate an autonomous bacillus, corresponding morphologically to the bacillus subtilis, but they admitted later that this organism was not present in all the cases they had afterward examined. Out of 7 cases they found a streptococcus in 4 and a staphylococcus in 2. Rasori in 1893 found Bianchi's bacillus in the

cerebro-spinal fluid in 1 case. Potts, Martinotti, and Cabitto found only ordinary micro-organisms. Ceni, in 1897, found constantly the staphylococcus pyogenes albus. Kotzowsky (1898) found a staphylococcus in 2 cases. Cappelletti (1899) confirmed the researches of Ceni and Kotzowsky: in 3 cases he isolated the staphylococcus pyogenes aureus and albus and the bacterium coli. Again, in 1899, Bianchi and Piccinino published a memoir in which they claim to have found their special bacillus in 2 cases; in a third case only ordinary cocci, while in a fourth their researches were negative. The writers conclude that these researches by various authorities tend to show that the complex symptoms of the disease may be due to various organisms, and that its gravity depends greatly upon the pathogenic character of these organisms. Carrier and Martin (*Archives de Neurol.*, Sept., 1901).

Study of the blood of patients suffering from acute continuous mania. In every case there was a persistent leucocytosis, which immediately prior to an attack of mania fell somewhat, then during the attack rose, perhaps as high as 40,000 per cubic millimeter of blood, and during the periods of interval fluctuated between 13,000 and 27,000. During the attacks the polymorphonuclear cells were relatively increased, but at other times averaged 60 per cent. Having isolated from the blood of a case of acute continuous mania, a very small coccus, the writer found that the blood of the cases of acute adolescent mania like that of the cases of continuous mania, had the power of agglutinating the organism completely in a dilution of 1 in 20. The serum of six other cases of adolescent insanity which did not present the clinical symptoms of recurrent mania, failed to agglutinate the same organism. The clinical symptoms, the leucocytes and the agglutinative action in the adolescent cases, compared with the same symptoms in acute continuous mania, show a striking resemblance. Everything points to the fact that they are the same disease process modified by the age of the patient. The

author treated on purely empirical grounds four cases of adolescent mania with antistreptococcus serum. While injected subcutaneously the serum produced no result, when given in 10 cubic centimeter doses by the mouth, the following were the results obtained: In Case I there was absolutely no result. In case II within thirty minutes of the administration of the serum, the patient became more quiet, the pulse fell from 10 to 15 beats in the minute, and the temperature fell 1 degree, but the course of the attack was not arrested. In Case III, within fifteen minutes of the administration of the serum, the patient regained self-control, the pulse and temperature fell and the effect lasted for about two hours. A second dose of 10 cubic centimeters arrested the attack. Two subsequent attacks were arrested in the same way. The patient made a good recovery, which the author attributes to the action of the serum. In Case IV, the administration of the serum also seemed to arrest the attack. The author believes that this empirical experiment lends support to the view that acute mania is an infective disorder. L. C. Bruce (*Jour. of Mental Science*, July, 1903).

Prognosis.—Recovery occurs in about 70 per cent. of cases. When recovery follows it is usually only after several months, from six months to a year being the usual duration of an attack. The recovery is rarely sudden, or gradually progressive. More often the patient improves for a time, to drop back in a day or two into a condition of excitement, followed again by improvement, and thus recovery is reached by a series of stages of improvement overlapping a series of relapses. In other cases the passing off of the stage of excitement is followed by one of depression, out of which the patient gradually awakes to his normal mental activity.

Death from exhaustion usually occurs early. Ordinarily about 8 to 10 per cent. of cases of mania die from exhaustion.

Under early and proper treatment, this proportion should be much diminished. Of the remainder the larger proportion results in progressive brain degeneration, presenting the characters of consecutive dementia.

Conclusions regarding prognosis of acute mania: (1) about 70 per cent. of all cases of acute mania are cured after running a course averaging several months; (2) early treatment in insanity hospitals has a favorable effect upon the course of the disease; (3) a family history of insanity does not necessarily make the prognosis unfavorable; (4) cases of mania occurring as sequelæ to disease—alcoholism or pregnancy—have a favorable prognosis, both as regards duration and ultimate cure; (5) cases due to slight injury of the head usually recover; (6) the return of the menstrual flow accompanying an improvement in the mental condition is an indication of a speedy return to health; (7) the younger the patient, the greater is the hope of recovery; (8) recurrent mania presents a bad prognosis for complete and lasting cure; (9) where the disease is of long standing the probability of recovery is poor; (10) the sudden onset of great maniacal excitement is an unfavorable symptom except in those cases following pregnancy or traumatism of the head; (11) sudden stoppage of the maniacal excitement must raise the fear of recurrent mania or of early relapse; (12) great increase in weight before the beginning of the quiet stage must be similarly interpreted; (13) the more severe the attack, the poorer is the prospect of complete recovery; (14) paralysis and convulsions must be looked upon as grave complications. Willerding (*Review of Insanity and Nervous Dis.*, Sept., '91).

Treatment.—The treatment of mania often requires great tact, perseverance, coolness, and command of therapeutic resources. In the first place, in case of any gravity, home treatment is generally impracticable. The noise, the motor unrest, the constant expert attention required, and the violence toward others

make it incumbent in most cases to remove the patient to an institution for the insane. It is customary in most hospitals for the insane to isolate the maniacal patient. In the writer's experience this sequestration is not to the patient's advantage. Keeping the patient in an open ward, preferably in bed, in the presence of other patients, constantly suggesting to him by precept and example that he is sick and requires treatment will usually soon quiet the most excitable maniac. It may be necessary to keep one or more attendants by the bedside all the time, to prevent him from getting up and running about and so exhausting himself. A bath, clean linen, and quiet, tactful nursing will do wonders in calming the excitement and dissipating the delusions of the maniac.

In the treatment of mania no restraint and rest in bed recommended, except when the strong-room is absolutely necessary. Baths, bromide and chloral, may be given, but for severe excitement or great sleeplessness an injection of hyoscine is necessary. Good nourishment should be given, but no beer, wine, or spirits. Baths at a temperature of about 23° C. given for two to five hours as a means of quieting the patient, with cold compresses to the neck. When the excitement is very great, instead of the baths a damp sheet should be used. In the evening 45 to 75 grains of bromide of potassium are given, and two to three hours later 30 to 45 grains of chloral. After ten days, if the patient is quieter, the bromide is lessened and the chloral is only given occasionally, and sulphonal or trional are substituted. Where bromide and chloral are useless, laudanum in increasing doses is given. Magnan (*Rev. de Psych.*, July, '97).

The general indications in the treatment of delirium are, first, to secure sleep; second, to overcome motor unrest; third, to prop up and maintain the patient's vitality by contributing to his nutrition; and, fourth, to discover and remove the cause upon which the de-

lirium is dependent. Collins Med. News, Feb. 26, '98).

There is no necessity to wait until some unfortunate accident or crime necessitates the tardily written certificate. Treatment is thus available much earlier than usual—a point the importance of which to the patient, to his friends, and to the community can scarcely be overestimated. It places "border-land" and early cases under the same therapeutic conditions that have been found efficacious against the kindred hysteria, cerebraesthesia, and bodily disease generally, and it gives the patient greater opportunities of having frequent co-existing or causative bodily disease properly attended to. It does away with the false distinction between mental and bodily disease and it altogether avoids the stigma and disgrace attaching to "lunatic" and "asylum." There is no signing of certificates, with its, at times, serious sequelæ to both patients and medical men, and the natural convalescing ground, the home, is much earlier and more readily available. J. W. Springthorpe (Lancet, June 14, 1902).

Careful attention must be paid to the bodily functions. A useful preliminary is a large rectal lavement, to remove fecal accumulations and prevent soiling of the bed. Feeding with nutritious food is of the first importance. Maniacs usually eat ravenously anything offered them. Care should be taken to prevent overloading the stomach with indigestible food. In cases where the pulse is weak and rapid, the addition of a moderate quantity of alcohol is often useful. Milk and eggs, with beef-juice, or partly predigested beef-powder, and some of the starchy invalid foods are perhaps the best form in which to introduce nourishment.

In cases of very active mania, a warm bath, with effusion of cold water, sometimes has such a calmative effect that patients who before refused food then took it freely. Binswanger (Centralb. f. Nervenhe., Mar., '91).

Sleep must be secured. If it does not follow the measures here recommended within a reasonable time, some hypnotic must be given. Among the hypnotics least likely to disturb digestion or depress the appetite are bromide of potassium, chloral, hyoscine, sulphonal, and trional. Clouston highly recommends chloral, 30 grains, with 10 minims of the tincture of cannabis Indica. A combination of bromide of sodium and chloral, of each, 15 grains, with 15 minims of tincture of hyoscyamus is also an excellent calmative. In cases of great weakness and rapidity of the heart's action, digitalis, strophanthus, or strychnine may be added to the bromide-and-chloral mixture. Paraldehyde is a valuable hypnotic in cases with depression. It is given in doses of $\frac{1}{2}$ drachm to 1 drachm in $\frac{1}{2}$ ounce of whisky, diluted with a little water. It usually produces sleep within an hour. A bottle of ale or beer is often an excellent hypnotic.

Opium, which is so useful in melancholia is generally contra-indicated in mania. The brain-hyperæmia is simply increased by the drug, and the symptoms heightened. In the late stages, however, where there is brain-exhaustion and the descent into dementia seems imminent, opium sometimes pulls the patient together and enables him to recover.

Opium or morphine recommended in the acute stages of mania. The heart should be sustained by digitalis. In cases of hyperæmia nothing is better than ergotine. In obtaining sleep and inducing bodily quiet, warm and prolonged baths, also hyoscine. Krafft-Ebing (Inter. klin. Rundschau, May 25, June 1, 8, 25, 29, '90).

"Chlorobrom," a mixture of bromide of potassium and chloralamid, is also a satisfactory hypnotic in mania. It does not produce depression or derange digestion.

In mania, chloralose, in doses of from $1\frac{3}{4}$ to $15\frac{1}{2}$ grains; preferably given in solution in boiling water. Sedative effect in from fifteen to twenty minutes after taking the drug. Haskovec (*Revue Neurol.*, Oct., '94).

Neutral duboisine sulphate an excellent sedative in all psychical and motor agitation. Sleep produced similar to physiological slumber. Dose varies from $\frac{1}{100}$ to $\frac{1}{40}$ grain. Loicano and Masuro (*Med. Standard*, May, '95).

Duboisine sulphate, by the mouth, and also hypodermically in doses of $\frac{1}{100}$ to $\frac{1}{32}$ grain, used in all cases of excitement; in acute mania its use was not followed by any beneficial results; single doses produced quiet for a time, but this was followed by more excitement. In delusional mania it was only used for outbursts of excitement, and was entirely satisfactory. In general paralysis the drug was used both occasionally and continuously, with satisfactory results. In melancholia bad results were seen; in no case was there any relief, and in some cases the excitement was increased, and there was a tendency to syncope, with hallucinations of sight and hearing. Used occasionally in dementia it gave satisfactory results, with rest at night. The danger of the drug is from cardiac failure, if given continuously. It should be used only in physically-healthy persons. On the whole, the drug is preferable to hyoscine or hyoscyamine, as the quiescent state induced is of longer duration, and there is less prostration. Skeen (*Journal of Mental Science*, July, '97).

In hypodermic doses of $\frac{1}{200}$ to $\frac{1}{16}$ grain scopolamine proved a good hypnotic in paroxysmal excitement, but not in habitual insomnia. It is especially useful in acute mania. Tomasini (*Brit. Med. Jour.*; *Epitome*, Dec. 4, '97).

Hydrobromide of hyoscine preferred to the hydrochloride. It is given in doses of $\frac{1}{8}$ to $\frac{1}{10}$ grain. In cases of mental excitement with delirium and destructive tendencies, especially in periodic mania, it is of great value, also in the delirium of alcoholics. In melancholia agitata as well as in other cases of sleeplessness, hyoscine often produces quietude when all other means fail. On

the other hand, it is not adapted for all cases of an hysterical nature, and especially in affections which require a constant use of sedatives. Marked valvular trouble and fatty heart contra-indicate it. Doerner (*Therap. Monats.*, June, '98).

After the acute stage has passed the physical strength returns, and the brain begins to return to its normal activity, great care is necessary to prevent relapses. All sources of irritation should be kept from the patient, visits of friends should not be allowed too soon or too frequently, and he should be kept under close observation until the normal mental stability is re-established.

GROUP IV. PSYCHOSES DUE TO MICROSCOPIC STRUCTURAL ALTERATIONS IN THE BRAIN (PRIMARILY PROBABLY NUTRITIONAL OR TOXIC).

General Paresis.

Definition.—General paresis is a chronic, progressive, diffuse, structural alteration of the cerebral tissue, with involvement of the cortical and meningeal blood- and lymph- vessels, attended by characteristic psychical and motor disturbances. The disease is incurable and leads to death usually within three years.

Symptoms and Course.—No single symptom can be regarded as diagnostic of general paresis, even in the advanced stages. The diagnosis must be made from a study of certain concomitant symptoms, partly psychical and partly physical. Of the latter, the motor disturbances are, as the various names given to the disease indicate, the most characteristic.

Among the early psychical symptoms are irritability and especially an instability of the moral and mental character. The subject is easily disturbed, emotional, of variable moods. His memory, especially for recent occurrences, becomes defective. He forgets dates, ap-

pointments, mislays valuable documents or other articles. The moral sense is often perverted. He loses that delicate sense of propriety by which his previous life has been guided. He becomes unconventional, consorts with drunkards and lewd females, makes indecent proposals to respectable women of his acquaintance, indulges in a latitude of speech and action not tolerated by the conventions of the social stratum to which he belongs; all this without recognizing any impropriety in it. He may make a public merit of his sociological study of the nude in brothels, and of his compounding with liars and perjurers. He may violate public decency by exposure of his genitals in the street, or show a coarse disregard for his own household by defecating in bed or urinating on the carpet in his room.

There is progressive inability to concentrate the attention. With the failure in memory, incidents, real or imaginary, are embellished with fanciful details, the truth of which is asserted and maintained with vigor, and all doubts are actively and often angrily combated.

The prevailing character of the psychical manifestations is one of exaltation. Cases occur not infrequently, however, in which the key-note throughout the whole course of the disease is depression. In some instances the diagnosis of melancholia would be justified if the psychical symptoms alone are taken into consideration. Delusions of persecution may also be present, but are generally attended by expansive delusions.

Delusions of grandeur are present in most cases of general paresis, although they cannot be regarded as essential or pathognomonic. Many cases of general paresis run their entire course without manifesting exaltation or expansive delusions at any time.

The delusions of grandeur are not only unreasonable, but the patient's reasons for his extravagant beliefs are either inadequate or he does not give any reasons. While his imagination seems to be vivid, as shown in his delusions, it is, in fact, decreased. His delusions are so unrestricted that the most modest healthy imagination at once recognizes their absurdity.

[There are no limits to the wealth, the power, or the accomplishments of the general parietic during the height of his delusions. One patient was going to build a railroad from Rome to Chicago for the sole purpose of bringing the Pope to see the World's Fair; another had such acute vision that he could see a thousand miles without any difficulty; another owned the entire United States, France, and Spain, with outlying provinces in China, India, and South America. He could have England, also, but didn't want it so long as the queen lived. GEORGE H. ROHE.]

These delusions are rarely fixed; that is to say, they do not possess the permanent character of the delusions of paranoia. While there is a general sameness of the main feature,—the expansiveness of the delusion,—the individual delusions constantly vary.

As the disease progresses, dementia becomes more and more marked. The destruction of the intellectual faculties is so complete that toward the last even the delusions disappear. This progressive dementia goes hand in hand with the physical deterioration of the powers, so that when at last death comes to end the scene, the vital machine may be said to go to pieces like the "deacon's one-hoss shay."

One of the earliest physical symptoms is persistent insomnia, not yielding to hygienic or medicinal agencies. It is often accompanied by intense and frequently-recurring hemicrania. The

sleeplessness and pain are believed by many to indicate intracranial pressure; but this is not absolutely certain. Ophthalmoscopic examination fails to show intracranial pressure. In other cases there is an uncontrollable desire to sleep. The patient falls asleep in the midst of his occupation or in company.

Early symptoms also are losses of consciousness varying in degree from momentary dizziness to apparently true apoplectic attacks. They are present in nearly every case and are important diagnostic signs. While they are frequent and severe in the advanced stages, they are often the first indication of serious cerebral disease. After severe attacks there may be hemiplegia, which, however, usually disappears in a few hours or days. These attacks are evidently not due to rupture or thrombus of the cerebral vessels, but probably to circumscribed œdema of the brain, which rapidly passes away.

[I have seen cases of general paresis in advanced stages with apoplectic attacks, sometimes with convulsions, followed by profound coma, contracted pupils, and Cheyne-Stokes respiration, and after predicting a fatal termination of the case within two hours have had the patients still in hospital three months later. GEORGE H. ROHE.]

Convulsions epileptiform in character, may also be present as early symptoms, but are usually met with in the later stages.

Sometimes the apoplectic attacks are due to internal hæmorrhagic pachymeningitis, and in these cases death often follows soon after the stroke.

Ordinary cerebral hæmorrhage constitutes the gross lesion in the majority of cases of paralytic insanity. It is also very common in senile insanity.

Multiple minute recent blood-extravasations are to be observed with considerable frequency in microscopical sections of the brain from the insane. Most of

such hæmorrhages are capillary ruptures of very small size. When they take place from larger vessels, the blood is often merely poured into the adventitial lymph-space. W. F. Robertson (*Edinburgh Med. Jour.*, Mar., '96).

Frequent among the early symptoms are those connected with the innervation of the iris. The pupil is usually irregular, mostly dilated, more rarely contracted, in the fewest cases normal in diameter. The pupils of the two sides often vary in size and reaction. The reaction to light and sensation may be retarded or entirely abolished. The Argyll-Robertson pupil, so characteristic of tabes, is also a frequent symptom of general paresis. It probably depends upon similar degenerative processes as in the former disease. It is said that the ocular symptoms,—inequality of pupils, myosis, and Argyll-Robertson pupil have been noted several years before the outbreak of the mental disturbances.

Two per cent. of all insane persons have lost the color-sense. The sense for violet is lost in about 10 per cent. of the cases, being almost exclusively limited to various forms of dementia (general paresis, senile dementia, organic dementia). This loss of color-sense is generally accompanied by a diminution of acuteness of vision and the sense of light. L. Cronstel (*Thèse de Paris*, '93).

Inequality of the pupils is at times met with in healthy individuals, and it occurs in general diseases of the most diverse nature. In 3010 cases of dementia paralytica the pupillary reaction to light was lost or diminished in 68 per cent. The Argyll-Robertson pupil of great diagnostic importance in general paralysis, and is one of the very early manifestations of the disease. It is usually bilateral; a continuous unilateral loss of the light-reflex is very rare. The first change is generally a diminution of the reaction to light, then a total loss, followed by paresis and paralysis of reaction to accommodation. Siemerling (*Berl. klin. Woch.*, No. 44, '96).

Early diagnosis of general paralysis:

1. In the great majority of cases of insanity in which reflex immobility of the pupil is present (92 per cent.) the diagnosis of general paralysis is justified. 2. In the great majority of cases of general paralysis (70 per cent.) isolated reflex immobility of the pupils is found. 3. Isolated double-sided pupillary immobility is characteristic of general paralysis. Still, in the earliest stages a limitation of the pupillary reaction may have a similar significance as above (1). 4. Immobility of the pupils combined with failure of the convergence reaction does not negative the diagnosis of general paralysis. 5. Isolated double-sided pupillary immobility may exist for years without the development of general paralysis or locomotor ataxia. 6. It is an early symptom of general paralysis, and has been seen for years before the ensuing general paralysis has developed. Schwarz (St. Petersburger med. Woch., No. 4, '99).

Other motor symptoms are changes in the deep reflexes. The patellar reflex is most often increased, but may be normal, diminished, or absent. It has no diagnostic significance except in connection with other physical or mental symptoms.

The facial muscles often show signs of involvement. A fibrillary tremor or twitching of the muscles about the mouth, sometimes a spastic condition of single muscles or groups of muscles about the face, loss of expression from paresis of certain muscle-groups may be present. On protruding the tongue the organ is tremulous or protruded in a spastic or jerky manner. Tremor of the hands is also present as a symptom of the advanced stage. The writing becomes irregular and "shaky."

The speech is jerky, slow, or "scanning." In advanced cases it becomes slurring. Syllables are dropped or repeated. Certain words are pronounced with difficulty, the test phrase "truly rural" usually running into "toory looral." Later the speech becomes indistinct and finally degenerates into an in-

articulate sound, in which no words can be distinguished. The early speech-defects are probably due to fibrillary tremor or twitchings of the tongue and lips. The later ones are paretic in origin.

In the earlier stages of general paresis, the physical signs are the most marked. Chief among them are: (1) the stammering or tremulous speech; (2) the tremor of the facial muscles and of the tongue; (3) the pupillary symptoms; (4) the change in the handwriting; (5) the exaggeration or the absence of the reflexes. The diagnosis, however, can only be established if some one or more of these signs are associated with mental symptoms. Any departure from the standard of thought and action that the individual has established for himself should always be regarded with suspicion, as should also any changes in his bearing that are not in keeping with his position in life. Defective judgment and especially defective memory are common changes. The early stages of the disease may be readily confounded with other conditions. The most common is cerebral neurasthenia. B. Sachs (N. Y. Med. Jour., July 2, '98).

The lines of expression in the face become obliterated in the later stages of paresis, but this sign can at times be noticed among the early symptoms on careful examination.

An early symptom is retention of the urine, which is due to loss of contractile power, or of reflex sensibility in the vesical walls. The overdistended bladder dribbles urine. This may be mistaken for a paralytic condition. In the advanced cases there is dribbling of urine and involuntary escape of feces from relaxation of the sphincters.

An annoying symptom of cortical irritation is a constant grinding of the teeth. This is so often present in general paresis that it is considered by some authors as pathognomonic, but it also occurs in some cases of simple dementia.

The gait in the early stages is spastic

or ataxic. In advanced cases it becomes slouching or dragging.

In the advanced stages, coincident with the progressive dementia, is increased motor debility. Tremors or twitchings give place to paresis and these again to complete paralytic conditions. The patient is no longer able to keep on his feet, and after a time he becomes bedfast. The power of articulation is lost and the voice becomes an inarticulate moan, extremely distressing to the hearer.

Mastication of food is forgotten and masses too large to pass down the œsophagus are partly swallowed and often cause asphyxia by compressing the trachea.

Vasomotor disturbances are frequent. The innervation of the vessels is diminished and there follows dilatation of the superficial vessels, redness or blueness of the skin, œdema and cyanosis of the peripheral members, and diminution of blood-pressure.

The hæmoglobin and red corpuscles in general paralysis vary with the body-weight, the hæmoglobin, however, diminishing more than the red cells. They both decrease in the early stage, are stationary in the so-called second stage, and fall again in the third. Winckler (*Inaug. Dissert.*, '91).

In general paralysis: 1. The hæmoglobin and red corpuscles are always diminished.

2. The specific gravity falls slightly below the normal.

3. Most cases show a slight leucocytosis, amounting on an average to about 22 per cent. above the normal. Early cases may have no leucocytosis whatever.

4. In the differential count a decrease is found in the lymphocytes along with a marked increase in the large mononuclear cells. The eosinophiles in a few cases are very numerous. J. A. Capps (*Amer. Jour. Med. Sci.*, June, '96).

Sometimes there are punctiform ex-

travasations of blood in the skin, and even actual hæmorrhages from the mucous surfaces, as from the bowel.

Consequent upon the defective innervation, combined with external mechanical influences (traumatism, prolonged pressure, etc.), trophic changes occur. Othæmatoma and bed-sores are often noticed, the latter especially when the patients have become bedfast.

The course of general paresis is, as a rule, steadily progressive. Cases occur in which there are remissions, sometimes lasting for months, but, except in the earliest stages, when the diagnosis must be regarded as somewhat uncertain, no cases of permanent arrest of the disease have been recorded.

Changes that have appeared in the clinical picture of progressive paralysis of the insane in the last thirty years discussed. In 1880 was found 55 typical cases and 37 of the form characterized by dementia. In 194 cases observed since, the typical form occurred in 37 cases and dementia in 70 cases. The greater frequency of marked remissions also noted, many of the patients being able to resume their occupation from time to time, even after the physical signs had been pronounced. The disease, in spite of its milder character, appears to have become much more frequent, particularly among the women; the present proportion being about 4 men to 1 woman and, in cases developing early in life, the sexes are almost equally affected. Children are more frequently affected than formerly, and this appears to be due to the greater frequency of hereditary syphilis. Mendel (*Neurol. Centralb.*, Nov. 15, '98).

The average duration of the disease is between two and three years. In some cases it has been known to continue longer, and cases are on record in which the duration is said to have been twenty years. On the other hand, it sometimes runs an acute course, ending in death in a few months.

Diagnosis.—Cerebral syphilis, tabes, chronic alcoholism, and cerebral neurasthenia must be differentiated from general paresis in its early stages. In syphilis there are more frequently symptoms referable to gross brain-lesions, ptosis, and other monoplegiæ, or more persistent hemiplegia than in paresis. At times the diagnosis is impossible during life. Tabes has strongly marked motor and sensory symptoms not usually present in general paresis, although they may complicate the latter.

As regards paresis, syphilis produces a pseudoparesis which is very hard to distinguish from true general paralysis. True general paralysis, where syphilis is but a concomitant element, or at best but a secondary cause, is not in the least influenced by specific treatment, while in syphilitic pseudoparesis a recovery may be anticipated if organic structural changes have not been produced. A. Morel-Lavallée (Gaz. des Hôp., Oct. 19, '89).

Study of 149 cases occurring at the Philadelphia Hospital. The old idea that the delusion of grandeur is the essential symptom of paresis seems converted, for paresis without delusion is extremely common (44 per cent. of the series). As to diagnosis, the forms of insanity most often confused with paresis of the simple form are (1) the so-called organic dementias, chiefly those due to embolism, thrombosis, or hæmorrhage; (2) presenility; (3) dementia præcox; (4) even epilepsy and alcoholic insanity. The prevalence of alcoholism among these patients demands more recognition than was formerly ascribed to it as an etiological factor, and the hasty acceptance of syphilis as the *sine qua non* of paresis needs reservation. As regards the so-called "crucial tests" of true paresis, the figures bear out the statement that any abnormality of the pupils not accounted for by a local lesion may serve as a sign of paresis. The consensual reflex was found as an independent sign in only a small number of cases. Atten-

tion is also directed to the confirmatory value of the paralytic attacks, the apoplectic form occurring more commonly early in the course of paresis, the epileptiform prevailing later. After these points come, in order of scientific value for diagnosis: (1) tremors of face, lips, and tongue, with resultant hesitancy of speech, and (2) impairment of consciousness and of judgment. Pickett (Phila. Med. Jour., March 29, 1902).

Chronic alcoholism sometimes presents symptoms resembling early general paresis, but the ocular symptoms of the latter are absent. The tremor and epileptiform attacks and mental manifestations are easily mistaken for the same classes of symptoms in general paresis. This is especially the case where the delusions are of the depressive form. In alcoholic insanity, however, there are more frequently delusions of suspicion, and, in married persons, delusions of infidelity on the part of the spouse, which may lead to criminal acts.

The insomnia, loss of memory, and hypochondriac sensations of neurasthenia may be mistaken for general paresis. In many cases it is only when the progressive character of the disease is noted that a positive diagnosis can be made. In neurasthenia delusions of grandeur do not occur, and, in place of the sense of well-being expressed by the paretic, the most minute details of physical symptoms are given. Thus, the neurasthenic can usually give an accurate account, with most wearisome details, of his gastric, abdominal, cardiac, or cerebral symptoms. The paretic, if he notices these at all, declares them of no consequence. Neurasthenia may be defined symptomatically, as a morbid sensitiveness, while, on the other hand, paresis is an abnormal lack of sensitiveness to morbid impressions.

A subject presenting the symptoms heretofore given, namely: persistent in-

somnia, with headache, a gradual change in his moral nature, loss of regard for public opinion; peculiarities in the psychical life, coming on so gradually as not to attract attention until opinions or acts more peculiar than usual are manifested; delusions, either of persecution, depression, or grandeur; irregular, dilated, or contracted pupils, with absence of the usual reactions to light and sensation; the persistence of the accommodation-reflex, heightened patellar reflex and attacks of faintness, attacks of unconsciousness or epileptiform convulsions should be viewed as a beginning case of general paresis. If the usual speech-defects characterizing this disease are present, the diagnosis may be regarded as reasonably certain.

In advanced cases of general paresis no difficulty should arise in diagnosis.

Causation.—General paresis — paretic dementia, general paralysis of the insane — is a disease of the middle period of life, rarely beginning before the thirty-fifth and still more rarely after the fiftieth years of life. Cases among children or in old persons are, however, not unknown. It attacks by preference persons in the higher walks of life, but among these is found especially in such as have more or less irregular habits. Syphilis is regarded by many authorities as the most prominent single cause, but cases frequently occur in which no evidence of syphilitic infection can be found. Mental stress, especially when associated with intemperance, venereal excesses, or other irregular habits are often found as precedent conditions and may perhaps be regarded as etiological factors.

The two most important etiological factors in precocious general paresis are heredity and congenital syphilis. J. Wigglesworth (*Brit. Med. Jour.*, Mar. 25, '93).

Analysis of two hundred cases in

Krafft-Ebing's clinic. Conclusion that syphilis is the chief cause of general paresis. Heredity seemed to be concerned in 11 per cent. of cases. Psychical causes could not be discovered. In 13 cases there was a history of traumatism, in 19 alcoholic excesses. Out of 175 cases with complete histories, 56 per cent. gave a positive history of syphilis, and 25 per cent. a probable history. In seventy-eight cases the period from infection to the symptoms of paresis varied from two to twenty-nine years. Hirschl (*Wien. klin. Rundschau*, No. 45, '95).

In forty-one cases of paretic dementia in children, syphilis could be traced in 87.8 per cent. Zappert (*Therap. Woch.*, iv, 289, '97).

Report to the Asylums Committee of the London County Council showing that in many cases of general paralysis there was usually a history of venereal infection, particularly in those cases of the tabetic type in which the dementia in the early stage was very slight. Lewis, of Claybury Asylum, investigated this point, and found that out of a total number of 200 males suffering from all forms of mental disease admitted to Claybury in 1897, 70 had suffered from venereal infection (including both soft and hard sores). Of these 200 cases 24 were general paralytics, and in 16 of them there were certain evidences of infection, doubtful evidence in 3, and no evidence in 5. Alcoholism was relatively infrequent as a cause. In 10 cases of juvenile general paralysis which Mott saw there were undoubted signs of congenital syphilis (Hutchinson's teeth, linear cicatrices, or interstitial keratitis) in no less than 8. Again, he found that atheroma of the aorta was comparatively frequent in general paralysis. Of 86 males dying under forty-six years of age, 24 had atheroma of the aorta; 60 of these cases were general paralytics, of whom 22 had atheroma, or 1 in 3, whereas the proportion was 1 in 13 for the other cases. Of 53 females dying under forty-six, 18 had atheroma; 18 of the cases were general paralytics, and of these 10 had atheroma, or more than half. It must be remembered that eminent authorities regard syphilis as the most important cause of atheroma of the

aorta. Mott (Transactions of Asylums Committee of London County Council, '98).

General paresis is increasing in frequency, males being still more often affected than females. The disease appears to be more common in married men; thus, of 89 male patients, 64 were married, 17 single, 6 widowed, and 2 divorced. The disease apparently occurs almost exclusively among married women. Steinach (Med. Record, Dec. 17, '98).

General paralysis is a disease directly due to poisoning by the toxins of bacteria whose point of attack is through the gastric and intestinal mucous membrane. The poisoning is probably a mixed poisoning, but bacillus coli is apparently one of the noxious organisms. The result of treatment with serum taken from a case of general paralysis in a condition of remission and injected subcutaneously into an early progressive case points strongly to the fact that some form of serum-treatment is the proper treatment for this as yet incurable disease. L. C. Bruce (Brit. Med. Jour., June 29, 1901).

It is more frequent in cities than in country-districts. Men are attacked from three to five times as often as women. The latter appear to be becoming more subject to the disease, as a few years ago the proportion in the two sexes was stated as one to seven. Clergymen are almost exempt, while actors and "men about town" are the most frequent victims.

Pathological Anatomy.—In general paresis we have a psychosis based upon recognizable structural alterations in the brain. These alterations are so disseminated that the entire brain undergoes a gradual loss of functioning power as a whole. The structural changes in the brain are found everywhere. The vascular sheaths are filled with white and red blood-corpuscles, the vascular walls thickened, and the calibre of the vessels diminished. In the substance of the

brain there is an increase of the connective-tissue elements which, we have reason to believe, produce atrophy of the brain-cells by pressure. There is also frequently close adhesion between the arachno-pia and the surface of the brain. There is pretty constantly a disappearance of medullary nerve-fibres. At times there are minute hæmorrhages into the substance of the brain.

The arachno-pia is generally cloudy and thickened. The convolutions are diminished in volume and the fissures wider than normal. The cortical substance is decreased. The average diminution in weight of the brain amounts to 100 to 200 grammes (3 to 6 ounces).

Arachnoid and pia mater examined in a series of patients with general paralysis, pellagra, acute delirium, and other psychoses, particularly in the region of the central convolutions, where the meninges in general are first subject to alterations. In general paralysis the well-known vascular changes found; they were even noticed at the beginning of the disease, before there was any trace of sclerosis or atrophy of the cerebral substance. Chronic hyperæmia of the encephalon and the consecutive changes considered as primary anatomo-pathological symptoms of paralytic insanity. In the pellagrous lunatic the pia mater presents diffuse opaque alterations, a slight augmentation of the connective-tissue elements, and occasionally an infiltration of leucocytes, collected around the vessels or isolated in the meninges. In the other forms of insanity a slight thickening of the pia mater was usually noticed; the tortuous vessels had rigid walls, as in the case of very old people or in those dying of marasmus. The thickening of the pia mater usually began at the level of the central convolutions. Francesco del Greco ("Revista Sperimentale di Freniatria e di Med. Legale in Relazione con l'Antropologia e le Scienze Giuridiche e Sociali," Reggio-Emilia, '93).

There is a widely-pervading cell-

degeneration of a granular, probably fatty type; overgrowth of the connective-tissue structure within the cerebral substance, and a diffuse, inflammatory change around the sheaths of the blood-vessels, with slighter alterations in the sheaths themselves. It is regarded as very probable that the beginning of the disease is to be found in some alteration of the blood-supply, followed by a peri-arterial lymphoid growth, disturbance of the lymph-currents, consequent malnutrition of the nerve-structures. The skull is at times markedly thickened. In the medulla oblongata and the spinal cord structural alterations similar to those in the brain are found.

Study of the cerebral cortex, cerebellum, medulla, and spinal column. In the latter both antero-lateral and posterior tracts are affected. The neuroglia is found proliferated, especially in those parts of the nervous system which are normally rich in neuroglia. These regions are in contact with the cerebro-spinal fluid or the blood. It is this distribution of the neuroglial hyperplasia, early in the disease, that points to the existence of a toxin carried in the fluids of the organism as its cause. The writer believes that the nerve-cells are affected just as early as the neuroglia, but, as we have as yet no means of staining the primitive fibrils of the nerve-cells, this cannot be shown. L. Marchand (*Presse Médicale*, Aug. 14, 1901).

"Pathologists are not yet agreed whether the essential morbid condition in general paresis is inflammatory or degenerative; whether the changes occur first in the nerve-elements, the stroma, or the lymph- and blood-vascular systems. Berkley, one of the most recent observers, found degenerative changes, and then, when the nerve-elements begin to atrophy and disorganize, an overgrowth of the spider-cells, with other fixed cell-

proliferation among the degenerating tissues; then follow the serous and sanguineous apoplexies and other incidental symptoms occasionally found."

Whether general paralysis is a disease *sui generis* or not, it is certain that the pathological appearances point to irritative (probably inflammatory) processes in the upper layers of the convolutions in the earlier stages, and to pressure signs from the presence of fluid in the later. T. Claye Shaw (*Brit. Med. Jour.*, Nov. 16, '89).

The whole process of paresis starts in the vessels, and from these inflammatory changes take place in the neuroglia, which leads to destruction of nerve-fibres and changes in the ganglion-cells. General paralysis defined as an interstitial diffuse encephalitis. Mendel (*Neurol. Centralb.*, Sept. 1, '90).

Attempts made to solve the much-discussed question, whether the degeneration of nerves in the progressive paralysis of the insane is dependent upon a primary degeneration of the vessels, by examining, from the same parts of the brain of paralytics, the capillaries for their condition and sections for degeneration of fibres. The results were, that in every spot where degeneration of capillaries were found degeneration of fibres could also be ascertained. Seven brains were examined, and it was found that the capillaries in the frontal convolutions were always degenerated. In the cerebellar cortex they were degenerated 4 times in 5 cases. In the occipital lobes the capillaries in 7 cases were healthy thrice, and those of the central convolutions, although only examined twice in either case, were found diseased. The cortex of the temporal lobe showed healthy capillaries once, diseased ones twice; that of the parietal lobe, diseased ones once and healthy ones twice. Paul Kronthal (*Neurol. Centralb.*, Nov. 15, '90).

Wasting of the fibres with axis-cylinders in the gray substance of general paralytics (confirming the previous observations of Tuzet). Delicate fibres in middle layer of gray matter first to dis-

appear. A. Meyer (*Allgemeine Zeitsch. f. Psychiatrie*, etc., B. 51, H. 4, '95).

It is probable that these primary nutritional disturbances are due to toxic influences.

In the depressive delirium which often precedes general paralysis, the sum of the waste-products eliminated in the urine descends below the physiological proportion. In the anxious delirium one observes, on the contrary, an increased amount of solids in the urine, in spite of the insufficient nutrition of the patients. In the last period, but not in the beginning, the carbonate of ammonium is found in the urine. Laillier (*Le Bull. Méd.*, Aug. 15, '90).

Series of experiments to determine whether the blood-serum of patients suffering from parietic dementia possessed any bactericidal qualities. The results were as follow: (1) in normal and non-paralytic individuals a bactericidal action was obtained and was most pronounced between the second and third hours; (2) this frequently fails completely in the blood of paralytics, or, if present, is very slight; (3) in those cases to which from 1 to 1½ grammes of chloral-hydrate had been administered on the previous day the blood-serum sometimes exhibited a distinct bactericidal action, and the author ascribes this to the slowly excreted chloral-hydrate that remained in the system; (4) the blood-serum of tabetics exhibited a bactericidal action; (5) the absence of a bactericidal action is a specific quality of the blood-serum of paralytics. It cannot be explained by disturbances in general nutrition or by alterations in the blood, but may possibly be accounted for by assuming an alteration in the alkalinity, by a decrease in the amount of NaCl, or perhaps by an alteration in the leucocytes, and in the alexins produced by them. No bacteria are found in the blood of paralytics. Idelsohn (*Phila. Med. Jour.*, from *Archiv f. Psychiatrie*, B. 31, H. 3, '99).

Prognosis.—The general experience is that general paresis is incurable. The prognosis is, therefore, unqualifiedly bad. While the progress of the disease

can be interrupted by appropriate management, no method of treatment is known by which it can be permanently cured.

Acute confusional insanity is the only mental disease besides general paralysis which may cause death. The prognosis is worse than in mania or melancholia. The more complicated and changing the form, the worse the prognosis. J. Séglas (*Archives Gén. de Méd.*, May, June, '94).

Treatment.—Obviously not much can be said about the treatment of a disease which, according to all observations, uniformly tends to a fatal ending. It is possible that an early recognition of the disease may lead to measures to arrest its progress. It must be confessed that at present our notions of such measures are extremely vague.

Complete rest from business and removal from all sources of irritation is the first object to be striven for. Dissipation, intemperance and venereal excesses must be abandoned. Removal to a properly managed institution as early as practicable is, therefore, to be urged. When the patient is at liberty and in control of money or possessed of credit, his expansive delusions will often lead him to the commission of acts which, while not dangerous, may be decidedly embarrassing to himself or others.

Antisymphilitic treatment may be of benefit even in those cases where there is no evident syphilitic taint. Mercury and the iodides, the latter in large doses, may cause arrest of the connective-tissue proliferation, and the absorption of the new formation in the brain and spinal cord. From ½ to 1 ounce of iodide should be given daily.

To combat the sleeplessness, chloral, bromides, sulphonal, and paraldehyde are indicated. In some cases, however, even excessive doses of these drugs fail to produce their beneficial effects. Opium

may be cautiously tried, and will sometimes be effectual.

Marked success in checking the convulsive seizures of general paralysis by hypodermic injections of ergotinine, $\frac{1}{100}$ grain in solution. One or two injections are sufficient to check the convulsions. Christian (*La Trib. Méd.*, Dec. 18, '89).

In general paralysis treatment must be guided not by the unfavorable prognosis, but by a conscientious endeavor to rescue the case. Many neurasthenics carefully treated are but general paretics in the earliest stages, saved before the fatal disease has a fixed hold. In cases of suspected paresis, the continuous ice-cap, ergot, and, in maniacal cases, injections of ergotine, the wet pack, sodium bromide, and, in proper cases, local blood-letting recommended. The iodides should be persistently tried, even in cases where a syphilitic history is not clear. Meyner (*Zeitsch. f. Therapie*, Aug. 1, '90).

Encouraging results obtained in the treatment of paretic dementia by cold wet packs, always accompanied by cold to the head in the form of an ice-bag or wet towel. The duration of the pack is from one to three hours. The pack is followed by massage and sometimes by a brief douche. This treatment need not interfere with special treatment, such as iodide or mercurial inunctions.

The details of a cold or wet pack, as used in this treatment, are as follows: As many blankets are used as are considered necessary to produce a good reaction in the patient, placing one blanket above another smoothly spread out upon the bed; over all is placed a linen sheet wet in cold water and the patient is laid on that.

In wrapping the sheet about him care should be taken to separate adjacent parts, as arms and legs, from the body by folds of the sheet; then he is wrapped in the blankets, tucking closely fold by fold. The patient's head should be wet before he lies in the pack, and after he is comfortably placed in it a wet towel should be wrapped about his head unless an ice-cap is deemed better. If patient is very feeble and temperature of the surface subnormal more blankets will be required, or perhaps hot bottles at feet.

Massage is usually given one-half hour after pack. In cases of active excitement the patient may be taken from the pack, rubbed or douched, and put directly back. If pyrexia is present it should be relieved by cool baths or short packs, with light covering, before the pack, above detailed, is given, otherwise the pyrexia is aggravated. Temperature should be taken twice day, and rise promptly met by ice to the head. Bowels should be carefully attended to to avoid autointoxication. Coddington (*Brit. Med. Jour.*, Nov. 13, '97).

The treatment of general paralysis, as in the treatment of all mental diseases, is preventive and moral, as well as medicinal.

Preventive: The avoidance of marriage where a history of insanity is marked, the early recognition of the incipient stages of the disease, and the avoidance of exciting causes, such as mental strain and excesses.

Moral: When the disease is recognized removal from home surroundings is of great importance, and a quiet out-door occupation the best suited to the bodily and mental health.

Medicinal: Bromides for excitement, and bromide combined with chloral if there is insomnia. In administering sedatives they should be combined with laxatives, and the combination of digitalis with bromides is most useful in relieving arterial pressure. Fletcher Beach (*Clin. Jour.*, Apr. 6, '98).

Great care is necessary in feeding advanced cases to prevent bolting of large morsels of food, and consequent asphyxia from entrance of food into, or compression of, the air-passages. Attendants should be instructed how to remove masses of food from the oesophagus.

In the treatment of choking among the insane manipulating windpipe upward from the outside will force food up into the throat so that it can be reached by the finger. R. M. Phelps (*Jour. of Nervous and Mental Disease*, Mar., '96).

In the paralytic attacks attention must be paid to regularly emptying the bladder and rectum.

Cleanliness and frequent changes of position in those patients who have become bedfast from the advance of paralytic symptoms will tend to avert bed-sores. When these occur, the recognized surgical measures—namely: cleanliness, bathing with dilute alcohol, and removal of pressure—are indicated.

Finally, all measures tending to make the patient more comfortable, and less objectionable to his surroundings should be employed.

Catatonia.

Definition.—Catatonia is a form of insanity characterized by depression, exaltation, stupor, confusion, and dementia, usually occurring in regular cyclical sequence. There is also a spastic condition of the muscles and a tendency to rhythmical movements.

Symptoms and Course.—There is nothing peculiar about the prodromic, or primary, melancholic stage. There are the usual symptoms of mental and physical depression. Self-accusation and delusions of negation are not infrequent. Attempts at suicide are occasionally made. Refusal of food is frequent, but not usually persistent. Forceful feeding generally soon overcomes the reluctance to eat. On the whole, the melancholia does not appear to be so deep as in the ordinary cases of melancholia. It has a closer resemblance to the depressive phases of certain cases of general paresis.

In the maniacal stage there is restlessness with exaltation, varying with depression, delusions of grandeur, or fits of rage, culminating in attacks upon bystanders or in destructive tendencies.

Mutism, or dumb stupor, is usually present as a stage in the course of the disease. It may persist for long periods, or may be transitory. There may be absolute mutism or simply a refusal to answer questions. The patient sits or

stands in one position, with head and eyes down, and apparently taking notice of nothing passing around him. Careful observation will show, however, that he often gives quick and watchful glances about and that he is not so deeply sunk in stupor as he appears to be. At times the patients mutter to themselves in a low tone, suffering nothing in their vicinity to distract them.

There is a generalized tension of the muscular system, in consequence of which the patient resists any change of position except such as he assumes voluntarily, or in which he has been placed. Thus, cataleptic states are not infrequent, although not so common as in hysterical conditions. The resistance to movement is probably always due to delusions of anxiety or fear, and is not uncommon in other mental disturbances, especially in melancholia and paranoia.

Among the somatic symptoms are othæmatoma, often anæsthesia, localized œdemas and other disturbances of nutrition. Loss of control over the sphincters is usually present. According to Kahlbaum, pulmonary phthisis is nearly always associated with the later stages.

Pathognomonic, in addition to some or all of the symptoms above mentioned, is a peculiar aberration of speech termed by Kahlbaum “verbigeration,” and a rhythmical or stereotypic movement of certain groups of muscles. A spastic pouting or “*Schnauzkrampf*” is described as especially frequent. Other movements are the constant twisting, fraying, or buttoning and unbuttoning of the clothes, or the patient walks in definite limited lines or areas, not diverging from his regular path.

Verbigeration consists in the rhythmical reproduction of sounds, words, or sentences, often without logical connection, which are repeated in a declamatory

or pathetic style. This verbal repetition is easily differentiated from the jabbering talkativeness or senseless rhyming mania of acute confusional insanity, or the drivél of advanced dementia.

In advanced cases consecutive dementia comes on, during which the stereotypic movements, verbigeration, and cataleptoid states may persist in a more or less modified form.

Causation.—While direct insane ancestry does not seem especially influential in the causation of catatonia, a neuropathic constitution, hereditary or acquired, is a usual precedent condition. Among other causes, masturbation is mentioned by authors as a frequent factor. While not denying the influence of this practice, the writer is not inclined to attribute to it much weight in the etiology of the affection.

Results of a study of twelve cases of katatonia. Clinically these cases correspond to the clinical descriptions of Kahlbaum and Kraepelin. Katatonia is an acute toxic disease with a definite onset and course, in which the symptoms vary according to the resistive power of the patient, but in which the following diagnostic symptoms are never absent: A prodromal period of gradual onset which leads into the period of acute onset with oral hallucinations, mental confusion, paroxysms of excitement, impulsive action, katatonic spasm of the muscles, a hyperleucocytosis which at the termination of the acute stage indicates a virulent toxæmia. In the second stage there is a condition of stupor with muscular resistance to passive movement. L. C. Bruce and A. M. S. Peebles (Jour. of Mental Science, Oct., 1903).

Diagnosis.—Stereotypic movements, muscular tension, and stupor are not infrequent in other mental disorders, especially in so-called acute dementia, paranoia, general paresis, acute hallucinatory delirium, grave hysterical conditions,

and the insanities of pregnancy, the puerperal period, and of lactation. For a time these symptoms may simulate catatonia, but prolonged observation will show that they are merely incidents in the development of the particular psychosis in question, which is easily recognized in its further course. Most of the cases reported by American writers as catatonia are probably of this nature.

Prognosis.—This is unfavorable. Recovery rarely occurs. Most of the cases die of intercurrent phthisis.

Pathology.—This has not been sufficiently studied. The macroscopical appearances in the brain resemble those of general paresis.

Treatment.—This is essentially symptomatic.

Consecutive Dementia.

Definition.—Consecutive dementia is a state of permanent and incurable weak-mindedness following an acute psychosis.

Symptoms and Course.—In one hundred cases of acute mania or melancholia, from 50 to 75 per cent. will, under appropriate treatment, end in mental restoration; 10 to 12 per cent. will die of exhaustion or intercurrent somatic diseases; and the remainder will run into chronic mania or melancholia or into dementia. By this term is meant an alteration in the mental functions characterized primarily by enfeeblement of the psychological processes. The subject may recover sufficiently from the acute psychosis to properly perform mechanical labor of various sorts, particularly if he is prompted by some one, but consecutive thought, especially upon a complex subject, is impossible. Such persons are sometimes spoken of as having recovered with defective action of the brain, and many of the cases of mania discharged from hospitals as recovered are examples of such partial destruction of brain-

power. He can continue doing his usual work, especially if it is mechanical and does not involve complex mental processes; but he is easily confused, is often irritable, may retain delusions or have hallucinations, and is altered in disposition in various ways. His friends will often remark that he is not the same since as before his illness, but it is often not easy to define exactly in what this alteration consists. In a more pronounced form of dementia there is great confusion of thought. Consecutive action as well as consecutive thinking becomes impossible. The dement of this stage may wheel a barrow, dig a trench, shovel sand, break stone, or chop wood with a good deal of energy, but every little while he stops, looks vacantly around, until his attendant calls to him, or until the repetition of some associative sight or sound calls up the remembrance of what he is doing, and of the necessity for "moving on." It is often extremely interesting to watch these mental paralytics at their occupation, and to note the breaks in the continuity of their mental processes.

Among the relics in all hospitals and asylums for the insane are many in whom the fire of maniacal exaltation has burned out. They lack all consecutive mental activity. To the loss of intellectual power and volition is added the failure of motor power. The subject has become a paralytic and sits or lies in bed, or on the floor, staring vacantly, taking no notice of his surroundings, passing urine and fæces unconsciously, eating everything placed before him, or put into his mouth, and sometimes picking up and swallowing the most disgusting things.

Speech is often defective in consecutive dementia. It is slurring or lisping, and sometimes stammering, or syllables are cut off or dropped out of words. This

may be due to structural change in the speech-centre or defect in the conduction of efferent impulses. At times there is mnemonic aphasia.

Diagnosis.—Consecutive dementia resembles in many respects idiocy and imbecility, from which it is easily differentiated by the history. General paresis rarely offers any difficulty, as the active delusions in this disease differentiate it readily from consecutive dementia.

Prognosis.—Consecutive dementia, being due to structural alteration in brain-tissue, is, in the present state of knowledge, incurable. It is often not actively progressive, and the dement may live in good physical health and weakened mental power for many years. In institutions for the insane tuberculosis finds most of its victims among the subjects of dementia.

Treatment.—This is purely symptomatic. Systematic employment and careful attention to nourishment and sleep will make most dements comfortable.

Senile Dementia.

Definition.—Senile dementia is a chronic, progressive weak-mindedness due to structural alteration in the brain occurring in advanced life.

Symptoms and Course.—As the physical powers decay with advancing years, the intellectual functions also become imperfect. There is in some cases a gradual alteration of the character of the person.

Memory of recent occurrences is usually impaired, while the recollection of past events is sometimes very detailed, if not exact. Old stories are told and retold without remembering that they were told before. The subject becomes suspicious of his relatives and friends, is easily excited and irritated, misplaces articles and, forgetting where they were placed, accuses others of stealing them.

Among the prominent symptoms are increased sexual desire, with diminution of power to perform the sexual act. The patient not rarely makes unseemly exposure of his person, and, as if conscious of his sexual incapacity, commits indecent assaults upon young girls.

The senile dement is obstinate and vain. He will not recognize the fact that his physical and mental powers are waning, but insists that he is as capable of conducting his business and other affairs as when in the prime of life. Thus, the doctor who is the victim of beginning senile dementia believes himself more capable than ever of attending to his professional duties, and resents the imputation that he is getting too old to do his work properly. The clergyman knows that he can and does preach better sermons than ever, and attributes the decrease in size of his congregation, if he notices it at all, to the influence of envious opponents who are endeavoring to lead his people away for selfish reasons. The story of the Archbishop of Granada in "Gil Blas" is an exquisite example of senile dementia.

Among the more striking physical symptoms are those associated with structural alterations in the central nervous system. There is usually a halting or lisping speech; the gait becomes slovenly or shuffling; there is loss of control over the sphincters, the urine and alvine evacuations passing into the clothing and bed unconsciously. There are also occasional slight paralytic strokes, sometimes with temporary loss of consciousness. These are, however, generally quickly recovered from.

The sleep is usually disturbed, although in the later stages the opposite condition, a constant desire to sleep, may be present.

There is often a great tendency to

stray away, requiring the patient to be constantly watched.

Senile dementia is rare before the sixtieth year. Its course is usually slow, running over several years. Striking improvement is sometimes observed, though it is rarely permanent. In the later stages when the patients are confined to bed, there are often large bed-sores, which increase the difficulty of treatment.

Diagnosis.—The history of the case is usually sufficient to prevent mistake. Some tardy cases of general paresis may be confounded with senile dementia, but a short period of observation should be sufficient to make a definite diagnosis.

The causation of senile insanities considered as those so remote as to have been beyond control, those in action in earlier periods of life, and those in action when senility is impending. Under the second class, which are within the range of medical direction, are principally the causes of vascular change and premature senility of the arteries. These are chronic alcoholism, syphilis, gout, rheumatism, venereal excess, great and prolonged physical strain, and intense and long-continued mental application, with anxiety or worry and lack of self-control. Ralph Lyman Parsons (Med. Record, Oct. 10, '96).

Reports on 192 autopsies in two years. In a large number of senile dementes the fundamental cause consisted in atheromatous degeneration of the cerebral blood-vessels and in the frequently resulting atrophy of the brain. These anatomical changes stand as the basis of senile dementia. Adolf Meyer (Path. Report, Ill. East. Hosp. for the Insane, '96).

Prognosis.—This is unfavorable. Recovery of normal mental function never takes place.

Treatment.—The treatment is symptomatic. The patient needs constant care to keep him clean, to prevent straying off, and to avert injury likely to result from his carelessness.

When there is defective circulation a mild stimulant may be useful. Sleep is best induced by malt liquors, paraldehyde, trional, or opium. Chloral should be avoided on account of its depressing effects.

Epileptic Dementia.

Definition.—A form of dementia occurring in advanced stages of epilepsy, due to structural alterations in brain-tissue.

Symptoms and Course.—A large proportion of epileptics are attacked by a secondary dementia, which is usually progressive.

In the early stages there are frequent outbreaks of violence, which may be due to hallucinations or delusions. The epileptic dement is often extremely dangerous from the sudden and unprovoked character of the violent outbreaks. He is usually quarrelsome with the weak and peaceably inclined, but soon acquires a wholesome respect for those who strike back. He usually makes constant complaints, often false, of ill-usage on the part of others. Untruthfulness is so frequent among epileptic demented that it may be almost regarded as a characteristic.

In advanced cases the failure of the mental and physical powers becomes very noticeable. The speech is affected and control of the sphincters is lost. Most patients die in *status epilepticus*, of intercurrent pneumonia, or of exhaustion.

Treatment.—All epileptic demented should be placed in appropriate institutions on account of the danger from outbreaks of violence. The usual remedies for epilepsy may delay the progress of the dementia, but no hope of arresting it can be entertained.

GROUP V. PSYCHOSES DUE TO GROSS LESION IN THE BRAIN.

Under the term *organic dementia* authors describe those forms of insanity due to destruction of areas of brain-tissue following syphilitic deposits, abscesses, hæmorrhagic infarctions, tumors, aneurisms, and cranial traumatisms.

Syphilitic Insanity.

Definition.—Insanity due to syphilitic new formation in the brain or meninges.

Symptoms.—Severe and long-continued headache, more intense usually at night, frequently precedes any psychical manifestations. Attacks of unconsciousness, sometimes convulsions and coma, are not rare. After one of these attacks there is frequently local or general paralysis, which may be transitory or permanent. Ptosis is a frequent symptom. Halting speech and actual aphasia may also occur.

Stupor and depression may alternate with maniacal outbreaks. The memory is often profoundly impaired, the patient forgetting even his own name, business, and place of residence. In many cases the symptoms resemble so closely those of general paresis, including delusions of grandeur, that a differential diagnosis is impossible during life. In most cases, however, the motor disturbances are of a more distinctly paralytic character, complete loss of power of certain muscular groups being more frequent than in general paresis. In advanced stages the dementia is usually profound.

Diagnosis.—This must depend largely upon the history. The presence of evidences of syphilis in other organs; sudden attacks of aphasia, following apoplectic or epileptiform seizures; hemiplegia and ptosis, with the psychical symptoms above mentioned, will permit a probable diagnosis to be made in the majority of cases. As stated, however, a positive differentiation from general paresis is often impossible during life.

Conclusions based on a study of syphilis in its relation to insanity summed up in the form of a suggestion for a provisional scheme of classification as follows:—

I. Insanity of early syphilis (primary and secondary).

1. Acute toxic insanity (analogous to delirium or mania a potu).
2. Melancholia with or without dementia, probably due to cerebral anæmia.

II. Insanity of late (tertiary) syphilis.

1. Insanity due to syphilitic disease of the base and vessels.
2. Insanity due to syphilitic disease of the convexity.

Most, if not all, cases of cerebral syphilis in which insanity has been caused by epilepsy will fall under the second head (II, 2), but should rather be classed with epileptic insanity, being only indirectly due to syphilis.

III. Metasyphilitic (parasyphilitic) insanity.

1. Insanity of tabes (so far as due to other than "moral" causes).
2. General paralysis of the insane.

This classification only includes cases in which there is certainly, or probably, a gross anatomical change at the basis of the mental symptoms. But it is obvious that there are various indirect ways in which a disease like syphilis may produce morbid action in unstable minds. Such are the fear of contracting the disease; the worry, remorse, and anxiety produced by its existence; and the pain and insomnia and other sensory symptoms so common in its course. With this class of cases, as being but the indirect result of the disease, and in no way peculiar, no attempt has been made to deal. W. R. Dawson (*Jour. Mental Science*, Apr., '98).

Syphilitic dementia has nothing characteristic about it, except that it is due to syphilis. There may be incoherent hebetude, simple depression, paralyses of the cranial nerves, apathy, anæmia, headache, clonic convulsions, eruptions, or bony lesions. Dementia may follow partial, paralytic, aphasic, or cephalalgic epilepsy, or it may occur without symptoms. Other signs of syphilis may or

may not be found. Hirtz (*Jour. des Praticiens*, Aug. 30, 1902).

Pathological Anatomy.—The syphilitic neoplasm may be in the form of a diffused gummatous meningitis, endarteritis, or gummatous foci in the brain. Meningitis may also result from gummatous osteitis of the cranial bones.

Prognosis.—In the early stages if appropriate treatment is promptly instituted the prognosis is not unfavorable. If, however, the morbid process has advanced, and brain-tissue has been destroyed by the neoplastic infiltration, or by the endarteritic process, no hope of restoring the normal condition can be entertained.

Treatment.—Mercurial inunction and potassium iodide in large doses should be employed as soon as a probable diagnosis is made. The iodide may be given in doses of $\frac{1}{2}$ to 1 ounce daily, pushing it to the limit of tolerance. The effects of mercury must be watched, and care taken to keep the patient's nutrition at a proper standard. Ferruginous tonics will generally be required.

In paralytic cases the development of bed-sores should be carefully guarded against.

Post-apoplectic Insanity.

Definition.—Insanity following destruction of an area of brain-tissue, due to cerebral hæmorrhage or embolism.

Symptoms.—In addition to the usual physical symptoms following gross brain-lesions,—aphasia, hemiplegia, etc.,—there are loss of memory, dementia, and occasional attacks of emotional disturbance or outbreaks of maniacal violence.

Treatment.—This can only be symptomatic. Securing good nutrition and sleep, guarding against bed-sores, keeping the patient as comfortable as possible, is all that can reasonably be striven after. Mental restoration is not to be expected.

Insanity from Cerebral Tumors and Abscesses.

In many cases of brain-tumor or brain-abscess no psychical symptoms are present. In others, however, there is loss of memory, apathy, dullness of perception, occasionally of intellectual perversion. Hallucinations and delusions may be present. When the neoplasm encroaches upon the visual sphere, hallucinations of vision may complicate loss of sight. In one case of a large abscess in the occipital lobe there was almost entire loss of vision, with delusions of personality, probably depending upon visual hallucinations. Christian and Raymond have reported cases of hallucinations of vision apparently depending upon intercranial growths.

Treatment.—Obviously the only treatment that can be considered is palliation of the symptoms and surgical interference.

Insanity from Cranial Traumatism.

Insanity follows cranial injuries much more frequently than is commonly supposed. The delirium attending concussion of the brain or traumatic meningitis may be ignored here entirely as appertaining entirely to surgery. But many of the cases recovering from the acute mental disturbances following shock and inflammation later become permanently insane.

Over 36,000 clinical histories examined with the view of determining whether there is such a form as traumatic insanity or whether the psychical disturbances following traumatism only exceptionally present characters of a special psychosis in the stricter sense of the term. There were found 23 females, 6 still living, and 102 men, 23 of whom were still under treatment. In 28 cases there was an heredity; in 97, none. The prevalent form of injuries was a fall on the head. In both sexes the consequences were epilepsy, melancholia,

dementia, mania, imbecility, and moral insanity. The psychical phenomena appeared in some cases a few days after the injury, and in others their first appearance varied from a few months to a few years. Gonzales (*Archivio Ital. per le Mal. Nervose e più Partic. per le Alien. Mentale*, Milan, '92).

It has been pointed out by Sir J. Batty Tuke and others that a condition closely resembling, if not identical with, general paresis follows injury to the brain.

[A case of this sort is at present under my observation. The patient, a painter, sustained a severe shock by falling from a scaffold and striking upon his head. Unconsciousness and delirium continued for ten days succeeded the injury. On recovering consciousness there were delusions of grandeur, which lasted for nearly a year, gradually becoming less marked. The pupils were for a long time contracted and fixed, not reacting at all to light and pain and only very slightly to accommodation. After a year the expansive delusions disappeared and there remained a moderate state of dementia, which appears stationary.]

Localizing symptoms of focal disease have never been present. GEORGE H. ROHE.]

Treatment.—In cases of fracture of the skull the recognized surgical procedures are indicated. In contusion, opening of the skull at a point opposite to the site of injury will often show evidences of inflammation of the meninges and contusion of the brain. It is probable that trephining and drainage would here sometimes prevent the subsequent development of insanity.

Case of insanity and epilepsy nineteen years after causative injury. Trephining followed by complete recovery. Binet and Rabatel (*Lyon Méd.*, May 12, '95).

Insanity due to injuries of head of rather infrequent occurrence. Two cases in which cure followed trephining. Cale (*N. Y. Med. Jour.*, Oct. 12, '95).

In the secondary dementias following brain-injuries, operative procedures, un-

less demanded by focal symptoms, are not likely to be beneficial.

Trephining cannot as yet be reckoned among methods of treatment. Excision of parts of cortex seems altogether unacceptable. Semelaigne (*Annales Méd.-psychol.*, May, '95).

GROUP VI. PSYCHOSES DUE TO TOXIC SUBSTANCES CIRCULATING IN THE BRAIN.

In this group are brought together not only those cases in which the cause can be clearly attributed to a poison circulating in the blood,—such as alcohol, lead, and drugs (salicylic acid, opium, cocaine),—but also those which are believed to be due to autogenetic or infective toxins, such as puerperal and surgical sepsis, uræmia, the toxins of influenza, typhoid fever, pneumonia, isolation, etc.

The type of all the different toxæmic psychoses is that described by different authors under the names “acute delirium,” “acute delirious mania,” “delirium grave,” “acute hallucinatory confusion” and numerous other synonyms, but which will be here considered under the name suggested by H. C. Wood, “Acute Confusional Insanity.” The general description will indicate the type, while variations will be mentioned under the specific forms.

Acute Confusional Insanity.

Definition.—An acute form of mental disturbance, beginning suddenly or with few prodromes, characterized by incoherence and confusion of thought, excitement, or at times stupor, hallucinations, fever, and a tendency to exhaustion.

Symptoms.—Headache and insomnia may precede the outbreak. Usually, however, the only noticeable prodromic symptom is a state of irritability or anxiety. In most cases the patients suddenly become excited, talkative, have

hallucinations or illusions, which are rarely of an agreeable character. They may see rats, snakes, spots of blood, etc. The visual hallucinations are often like those of delirium tremens, so graphically described by Kerr in the first volume of this *CYCLOPEDIA*. Auditory hallucinations may also be present, but are infrequent. The hallucinations and illusions are usually of a changeable and fleeting character. Sometimes there are delusions of suspicion and persecution, and occasionally delusions of grandeur. The patient soon becomes incoherent, loses all relation of time and space, does not recognize his surroundings, and confounds his own and others' personality. There may be sudden outbreaks of violence, which sometimes lead to homicidal acts, as in cases of puerperal and alcoholic insanity. The hallucinations and illusions are sometimes of an erotic character.

Temporary lucidity may occur, but is usually transitory.

Some patients are excessively loquacious, chattering senselessly all the time, making nonsensical rhymes, or repeating a great number of words having a similar sound. Thus, a remark that the patient looks bright will lead to a string of words like: “bright, light, sight, tight, fight, night, kite,” as if read from a rhyming dictionary. At times the patient makes new and often bizarre words. This is perhaps a form of amnesic aphasia. At other times there is mutism with muscular rigidity, the patient being apparently in a cataleptic condition.

Frequently there is great motor restlessness. The patient is kept in bed with difficulty, and, if allowed to get up, runs about the room or ward, shouts, laughs, pounds against doors, breaks windows and furniture, and tears his clothing. He does not control his sphincters and

passes urine and fæces into the bed and clothing.

There is usually fever, with rapid, and, in advanced cases, feeble pulse. The tongue is dry and coated, there is loss of appetite and frequently refusal of food, although this can usually be overcome without resort to forcible feeding.

Causation.—Probably toxæmia in all cases. The poisonous materials may be absorbed from the intestinal canal, from wounds or septic areas, or may be formed in the blood, tissues, or glands. They may be autogenetic or introduced from without. In some cases (Rasori, Kyle, Babcock) organisms have been found, but their specificity has not been demonstrated.

Acute confusional insanity occurs during or after infectious diseases (typhoid fever, influenza, pneumonia, rheumatism); after surgical operations, in the puerperium, during lactation, after cranial and other traumatisms, neuritis; from the ingestion of alcohol, opium, cocaine, lead, and other drugs; from the inhalation of certain poisonous gases,—sulphide of carbon, sulphuretted hydrogen, etc. Cerebral exhaustion, fright, anger, and other psychical shocks are also said to cause this form of mental disturbance.

Diagnosis.—The differentiation must be made from mania and melancholia. The affection is frequently confounded with the former. Many cases pronounced mania, even by expert alienists, belong to the group of acute confusional insanities. Pure mania—that is, typical exaltation without incoherence—is not as frequent as it would appear to be from statistical tables. Worcester puts the matter very clearly when he says “there are two distinct classes of cases, which have in common the symptoms of motor restlessness, loquacity, destructiveness,

and violence. In the one (mania) there seems to be, at the outset at least, an exaltation of some of the mental faculties. The patients appreciate perfectly well their surroundings; perception seems preternaturally acute; memory appears to be quickened, so that long-forgotten circumstances are related with the utmost accuracy. The patients show an extraordinary quickness in repartee, and often a diabolical ingenuity and cunning in mischief. They are always ready with an ingenious and plausible explanation of their extravagant conduct. The elation which is present is the natural reflex of the feeling of unbounded, unimpeded energy. Hallucinations are seldom, if ever, present; delusions may be entirely wanting, and, if they exist, they are the natural expression of the emotional state. In the other class, on the contrary (confusional insanity), there is, from the beginning, evident intellectual impairment, which may exist in any degree, even to an entire failure to rightly recognize any of the persons and things about the patient. Memory is impaired or practically abolished; the acts of mischief and violence are done without any apparent purpose, and, when any explanation of them can be obtained, it is utterly irrelevant or evidently founded on some postposterous delusion. Hallucinations are extremely common, and, with vague, incoherent delusions, dominate the whole conduct of the patient. As a rule, there is no evidence of any feeling of elation.

“The distinction between melancholia and confusional insanity, with depression, is of the same sort. The disorder in melancholia is primarily emotional. The patients appreciate perfectly their surroundings, they recognize persons and things; they can reason correctly on topics indifferent to them if their attention can be fixed upon them; their delu-

sions are the expressions of the overpowering feeling of impending evil, which makes everything inconsistent with it seem incredible. In confusional insanity, on the contrary, when there is the feeling of depression, it is the result of the delusions, which are vague, incoherent, and illogical."

Many of the cases pronounced "agitated melancholia" and "melancholia with stupor" are doubtless cases of confusional insanity.

Prognosis.—The prognosis of acute confusional insanity is generally favorable. While a considerable proportion die from exhaustion under the customary methods of treatment, the number passing into dementia is comparatively small. The recovery-rate should be, under favorable conditions (early treatment, careful nursing), at least 75 per cent. The greatest danger is from exhaustion.

Treatment.—The tendency to exhaustion being an ever-present one in acute confusional insanity, the first and most important requisite in the treatment is rest in bed. Isolation is not necessary, and, in the opinion of the writer, not desirable. Patients may at times be treated successfully at home, but where an institution is accessible, the chances for recovery are better if the patient is removed to one.

Nutrition demands constant attention. Easily-digested food in sufficient quantity must be provided, and the physician should satisfy himself that the patient gets it at the proper times. Forcible feeding is rarely necessary, but many patients require urging to eat. Such a one is liable to suffer in the hands of a careless nurse or attendant. Stimulants are often necessary, especially in cases with much fever.

The insomnia and delirium can often

be overcome by warm baths, but if the usual hygienic means of producing sleep fail, hypnotics must be resorted to. Of these, opium is to be preferred, on account of its stimulant properties. Chloral, hyoscine, and paraldehyde are not recommended, the former on account of its depressant effect upon the heart, and the two latter because they interfere with nutrition. Next to opium, sulphonal and trional may be cautiously tried. Digitalis, strophanthus, and strychnine are often of great value to tone up the depressed heart. The bowels should be kept open by mild saline purgatives.

Tincture of chloride of iron in large doses is often of value. Under proper management, recovery is often remarkably rapid. All sources of toxæmic infection should be sought for, and if possible removed.

Puerperal Insanity.

Definition.—Mental disturbance occurring in the puerperal period, due to toxæmic infection. The clinical form of the disease is usually acute confusional insanity.

Symptoms and Course.—The symptoms of puerperal insanity are usually those of acute confusional insanity. The outbreak of the disease usually occurs in the first week of the lying-in period. It is in almost all, if not in all, cases related to certain well-known symptoms of puerperal sepsis. Fever is nearly always present. Changes in the quantity and character of the lochia are frequent. There may be prodromic symptoms, although usually these are not well marked. This consists either in depression, irritability, or emotional instability. The outbreak usually begins with excitement, rapidly ending in incoherence. The usual feelings are perverted. The patient may have attacks of violence during which attempts are made on the life of the hus-

band, the newly-born child, or other children, if there are any. These attempts often have a religious basis; at other times they are based upon delusions of jealousy.

Not infrequently the hallucinations and delusions of the patient are of a sexual character. The most refined women will surpass the imagination of the veriest rake and gutter-snipe in their obscenity and vulgarity of language and action.

Motor excitement is common. There is frequently a tendency to remove the clothing. In some this appears to be a desire to expose the body to view; in others it probably is due to an hallucination of common sensation, rendering the weight or pressure of the clothing unbearable.

A second stage following this excitement is often one of depression. The distinction from true melancholia is, however, easy. The patient gets apathetic, there may be depressive delusions, suicidal tendencies may develop, and there may be alternations of excitement and depression, with incoherence as a dominant symptom, lasting for years. While cases end not infrequently in secondary dementia, this is not frequent. The writer has seen an apparently complete recovery from puerperal insanity after six years' residence in an asylum.

The stuporose stage of confusional insanity is usually passed through by puerperal cases on the way to recovery or dementia.

Diagnosis.—The diagnosis of puerperal insanity cannot be made from the symptoms. It is not a special variety of insanity symptomatically, but etiologically. The cases of insanity occurring early in pregnancy, which are so often classed with the puerperal insanities, have generally no etiological relation

with them. On the other hand, cases of lactational insanity frequently belong to the same class of toxæmic psychoses.

When the premonitory symptoms of puerperal insanity are observed—that is, change of manner and feeling with excitability—extreme quietude of surroundings must be insured, and careful, skilled supervision of the patient enforced to guard against infanticide or suicide by impulse. The bowels must be attended to, and, if there be early insomnia, a sedative draft of potassium bromide, $\frac{1}{2}$ drachm (2 grammes), and chloral hydrate, 15 grains (1 gramme), must be given at night. The diet should be liberal and sustaining. In all cases the urine must be tested for albumin. The free use of sedatives and hypnotics must be avoided as much as possible. In all cases in the maniacal form opium and its preparations are to be avoided. The child is to be weaned at once. In the melancholic type the preparations of opium and diffusible stimulants are indicated. A gain in weight, except when dementia has supervened, is a favorable sign. E. W. White (Brit. Med. Jour., Feb. 7, 1903).

Causation.—As stated in the definition, the writer believes puerperal insanity to be due to toxæmic infection. The reasons for this opinion are the following:—

1. Puerperal insanity occurs, in the great majority of cases, within the first ten days after delivery—about one-half in the first five days—the same period during which puerperal infection usually occurs.

2. It is usually accompanied by elevation of temperature and other evidences of febrile disturbance.

3. The clinical form in which puerperal insanity manifests itself is, in the majority of cases, that of acute, delirious, or confusional mania. Depressive states are rare except as secondary forms. In other words, the most frequent condition

is one most closely resembling febrile delirium.

4. The death-rate is much higher than in simple mania. Death occurs from exhaustion, usually with high temperature and rapid pulse.

5. Post-mortem examinations, though apparently infrequent in these cases, have shown grave involvement of the pelvic viscera.

6. Examinations of the pelvic organs during life show lacerations of the perineum and cervix uteri (facile channels of infection in the puerperal woman). As secondary conditions are found intrapelvic (peritoneal) inflammations, and consequent abnormal locations, fixations, and congestions of the uterus, tubes, and ovaries.

In the Rotvold Lunatic Asylum during the years 1892-1900, out of 1674 women, 82 (4.82 per cent.) were suffering from puerperal psychoses, but as 17 of these cases had suffered from previous mental affections, the percentage of primary puerperal cases was 3.88 per cent. Infection can undoubtedly lead to mental affection in the puerperium, but other causes play their part,—child-birth itself, for instance, as in one patient, who a couple of hours after each of her five confinements fell into an abnormal mental condition that persisted two or three months. Other causes are to be found in intoxication (autointoxication,—*e.g.*, eclampsia), profuse hæmorrhage, overexertion, and mental impressions, and, as a rule, various etiological factors are combined. Puerperal psychoses have no special syndromata. The prognosis appears from these comparative statistics to be good, even for cases due to infection if the infection is not fatal in itself. Prognosis is better for primiparæ than for women who have previously had children, and more favorable the younger the patient. Widerøe (Tidssk. nord. Retsmed. Psyk., 1902).

Prognosis.—The prognosis of puerperal insanity is favorable: 75 to 80 per

cent. recover, but a large proportion of the remainder die of exhaustion.

Results in 259 cases of puerperal insanity, of which 120 occurred during the puerperal period, 83 during lactation, and 56 during pregnancy. The insanity of pregnancy is more common where the pregnancy is illegitimate and in the first confinement. Acute melancholia with suicidal symptoms was present in 41 per cent. of these cases. During the early months insanity is less acute than when the patient becomes insane just before her labor. The sex of the child has no influence upon the occurrence of insanity. Puerperal insanity occurs after the first confinement in 33 per cent., and usually develops suddenly. During lactation the symptoms are those of general physical exhaustion, with great depression. It has a tendency to become chronic. Low forms of inflammation, thrombosis, gangrene, and phthisis are seen during the insanity of lactation. Suicidal and infanticidal tendencies are also common where insanity began more than six weeks after labor. Jones (Trans. Obstet. Soc. of London, Vol. lxx, Part i, 1903).

Treatment.—The principles of treatment indicated under acute confusional insanity are in place here. Bed-rest, good food, and hypnotics when necessary are the indicated remedies.

Bearing in mind that puerperal insanity is an infection psychosis, the local sources of infection should be sought out and removed if possible. In some cases there is simply sapræmia due to absorption of septic materials from the birth-canal. Here the use of douches of hot water, medicated with antiseptics or not, are in order. In cases of purulent endometritis curetting of the interior of the uterus with repeated irrigation or gauze packing will be required. In cases where tubal, para- or peri-metric inflammatory disturbances have occurred, the proper procedure has always seemed to the writer to be the operative removal of the foci of infection. Even in cases of

long standing (two to five years) the operative removal of local sources of irritation and infection has resulted in entire cure of the mental disturbance.

Lactational Insanity.

Definition.—Mental disturbance occurring during the period of lactation, usually coming on from six weeks to ten months after labor. Prevailing types: confusional insanity and melancholia.

Symptoms and Course.—In the depressed cases all the phenomena of melancholia are usually present. Frequently there is simple depression without hallucinations or delusions. Suicidal tendencies are frequent.

The cases usually described as manicacal belong, in the majority of instances, to the acute confusional type. There are varying hallucinations and delusions, incoherence, refusal of food, generally fever, want of control of the sphincters, and a tendency to exhaustion.

Etiology.—Prolonged or excessive lactation is given as the chief cause of insanity occurring during the nursing period. Careful inquiry will, however, show that certain conditions favoring toxæmic infection are often present. Thus, a mammitis or mammary abscess not rarely precedes the mental disturbance. Defective uterine involution is regarded by Bevan Lewis as a factor. The writer has found lacerated cervix and endometritis present in some cases.

Diagnosis.—The occurrence of confusional insanity during the nursing period is the only diagnostic feature. There is nothing distinctive in the symptomatology. Between 3 and 4 per cent. of all cases of insanity in women occur during the nursing period.

Prognosis.—Moderately favorable. From 40 to 50 per cent. recover. Clouston claims as high a proportion as 77 per cent.

Treatment.—Removal of local sources of infection or irritation. Good food and hæmætic tonics are usually indicated. Arrest the drain upon vital power by stopping the nursing.

Saturnine Insanity.

Definition.—Insanity following the absorption of lead.

Symptoms and Cause.—Two forms of insanity from lead are described. In the one the patient is incoherent, but not very much disturbed. In the other there is violent, noisy behavior with incoherence, followed by deep sleep or coma. Tremor and subsultus tendinum are usually present. At times there are epileptiform convulsions.

Diagnosis.—The usual objective signs of lead poisoning are present.

Prognosis and Treatment.—The disease is extremely grave. About one-fourth of the cases die in the attack. Dementia may follow in cases escaping death. The majority of cases recover with or without mental defect. The treatment is that of lead poisoning.

Uræmic Insanity.

Definition.—Insanity occurring in the course of Bright's disease and due to the non-elimination of toxic materials from the blood.

Symptoms and Course.—Christian, Alice Bennett, Bondurant, Tuttle, Babcock, and others have shown statistically that a large proportion of the insane in hospitals and asylums in this country have chronic renal disease. Irrespective of the general etiological significance of this fact is the occurrence of cases of insanity in the course of chronic Bright's disease and probably depending upon the same causative factors as other symptoms of uræmia. In a recent case observed by the writer there were depressive symptoms alternating with delusions of persecution; so that the diagnosis had,

at different periods, fluctuated between melancholia and paranoia. The case terminated in uræmic convulsions with amaurosis. Maniacal delirium sometimes occurs. Clouston refers to cases of violent uræmic delirium, ending rapidly in death. This *CYCLOPÆDIA* (see *BRIGHT'S DISEASE*, volume i) contains abstracts of a number of cases that show the varying symptomatology.

Systematic examination of the urine should be part of the routine in all examinations of insane persons.

Satisfactory clinical observations, together with post-mortem findings, clearly demonstrate the occurrence of pronounced insanity as a result of all forms of kidney inflammation as well as other renal disorders. In a great majority of these cases the mental disorder is to be attributed to uræmic intoxication. There is no special form of insanity from renal disease, though the different forms of melancholia are those most frequently observed. Auerbach (*Allgemeine Zeit. f. Psych.*, etc., B. 52, H. 2, '95).

Only 2 cases of uræmic insanity seen among 3000 carefully observed lunatics. It appears, however, that uræmia, both acute and chronic, may lead to insanity. Bischoff (*Wiener klin. Woch.*, No. 25 '98).

Treatment.—In addition to the usual remedies for the uræmic condition, morphine is often necessary to quiet restlessness and delirium.

Post-febrile Insanity.

Definition.—Insanity arising in the course of or following infectious diseases.

The ordinary febrile delirium is not included here, although probably depending upon the same essential cause: *i.e.*, a toxæmia.

[Sydenham, over two centuries ago, described delirium and comatose stupor occurring in the course of small-pox. He also referred to "a sort of mania which succeeds long-continued intermittent fevers and at last degenerates into idiocy." Here is evidently meant, not a transitory delirium, but a prolonged

acute psychosis terminating in dementia. In the light of our present knowledge, the explanation of Sydenham—"this comes from weakness and vapidity of the blood brought on by overlong fermentation"—seems almost prophetic. Benjamin Rush mentions "fevers of all kinds" among the causes of insanity, and refers specifically to one case following measles. Murchison refers to cases of mania and imbecility following typhus and typhoid fevers. In 1880 Kraepelin collected over four hundred cases of insanity occurring in connection with febrile diseases. *GEORGE H. ROBE.*]

Insanity has been observed during the course of or following typhoid, typhus, and malarial fevers, small-pox, measles, erysipelas, rheumatism, gout, cholera, and influenza. The last-named disease has preceded insanity in a large percentage of cases occurring within the past nine years.

It is a comparatively rare occurrence for actual insanity to develop during the course of bodily disease. Mental disease most commonly occurs after fevers, poisons, injuries and operations, and heart disease, and perhaps in this order of frequency. In the early stages of fevers and after injuries and operations, mania is the common form of insanity, but in other conditions depression is more common, though the commonest form is an insanity with marked delusions of persecution, often associated with auditory hallucinations. There is no special form of insanity connected with special bodily disease with the exception of the condition which accompanies alcoholic paralysis, and which is marked by a pronounced failure of memory for time and also for place. Insanity occurs with unusual frequency in bodily diseases associated with peripheral neuritis, as in poisoning by alcohol or carbon monoxide. Where the cause is not continuous the mental symptoms in the great majority of cases disappear. Reynolds (*Jour. Mental Sci.*, Jan., '94).

Symptoms and Course.—The clinical forms of mental disturbance described as following febrile diseases may be confu-

sional insanity, melancholia, and mania. Purely exalted conditions seldom occur. When there is melancholia, it is usually associated with hallucinations and delusions. The hallucinations and delusions of the acute stage often persist in the stage of dementia.

[I have known a case of confusional insanity following erysipelas in which, seven years after the acute outbreak, the hallucinations of hearing and delusions of persecution and personality are present in their original force. In a case of depression following influenza delusions of personality with persistent mutism (not stuporose) still remain, five years after the beginning of the attack. Thayer has reported a case following typhoid fever in which there were depressive symptoms with hallucinations of sight and hearing. GEORGE H. ROHE.]

Incoherence with hallucinations, illusions, and delusions are usually marked symptoms of post-febrile insanity. In heavy drinkers a violent maniacal delirium sometimes occurs during the height of the febrile process.

Febrile delirium, during an infectious disease, is an acute attack of insanity. There are the febrile mental derangements proper to the fever (*psychoses fébriles*), and there is the delirium of convalescence (*psychoses asthéniques*). Toward the end of acute infectious diseases there is the "delirium of inanition," which may go on to the delirium of collapse. Weber (*Medico-Chirur. Trans.*, '65).

Though asthenic delirium is the most common kind during convalescence, other kinds are met with, sensorial illusions being often present. There is, probably, in such cases, a cerebral intoxication due to microbic products of the virus which has set up the disease. One great distinction between the psychoses of convalescence and the delirium of fever lies in the evident influence of heredity and the personal antecedents of the patient, upon the character of the delirium in the former case (Kraepelin, Savage), in contrast to its uniform course in the latter;

in fact, heredity appears to play the chief part, and the acute disease is often only the accidental cause of the mental alienation. Christian (*Archives Gén. de Méd.*, Sept., '73).

Two cases complicating pneumonia have come under my notice. Clouston has laid especial stress upon the mental depression succeeding influenza. He says the last epidemic "left the mental and nervous tone of Europe lower by some degrees than it found it," and "no epidemic of any disease on record has had such mental effects." However true this may or may not be of Europe, there is, in my opinion, no evidence that similar disastrous effects have followed the epidemic in America.

Prognosis.—This is usually favorable. If the patient escapes the dangers of exhaustion in the acute stage, recovery takes place in from 70 to 80 per cent.

Treatment.—The treatment of post-febrile insanity usually requires careful attention to the nutritive functions. Tonics and stimulants are nearly always indicated. When hypnotics are necessary, the depressive drugs—chloral, bromides, sulphonal—should be avoided. Opium and cannabis Indica are often of great value.

Post-operative Insanity.

Definition.—Insanity following, immediately or remotely, operations upon the body.

Varieties.—The occurrence of insanity as a sequel of surgical operations has long been known. The more transitory forms of mental aberration, termed "traumatic" or "nervous" delirium, are recognized by all surgeons, although probably less frequently seen since the general adoption of aseptic methods in surgery. Within the past few years especial attention has been drawn to insanity following operations upon the female generative organs, and by some this occasional

occurrence of mental disturbance has been held to be a contra-indication to the performance of such operations. It has been maintained that insanity follows removal of the uterine appendages with especial frequency, and that therefore the possibility of this unfortunate complication should demand particular attention before subjecting a patient to operation.

There is no proof that genital irritation in the male or female can cause nervous or mental disease, except in a predisposed person. The proof is not yet absolute that genital irritation can produce nervous and mental disease even in a predisposed person. L. C. Gray (*Trans. Med. Soc. of State of N. Y.*, '93).

Gynæcological operations should be performed on insane patients only when the physical condition endangers life or renders it insupportable. Patients should be in a calm frame of mind before the operation and previous moral treatment instituted before it is undertaken. A. H. McFarland (*Annals of Gynæcology and Pædiatry*, Oct., '93).

In all cases where the menstrual epoch acts as the exciting cause of insanity, the ovaries should be removed, even if there is no evidence of local disease. Eliot Gorton (*Med. Record*, Aug. 25, '94).

Out of 300 castrations, in 200 cases operation had a beneficial effect; in 100 it was doubtful or unfavorable. In 2 personal cases, both said to be cured, same results could have been reached without mutilation. Kraemer (*Allgemeine Zeit. f. Psych.*, etc., B. 52, H. 1, '95).

Post-operative insanity is most frequently observed following gynæcological operations or those upon the eye. But it only occurs rarely. In most cases there is some hereditary psychical tendency. Delirium tremens or senile dementia may occur after operation. Post-operative insanity occurs in women more often than in men, and is very rarely seen in children. Degeneracy predisposes to it. The general condition of the patient before operation is an important factor, as is any cause of emo-

tion. Psychoses rarely appear before operation from fear of the operation. Finally the anæsthetic or the antiseptic used may cause insanity by producing an intoxication, or there may be an auto-intoxication. Clinical symptoms vary exceedingly. The prognosis, diagnosis, and treatment are the same as though the condition had not followed operation. The entire literature is cited. A. Pilez (*Wiener klin. Wochen.*, Sept. 4, 1902).

The details of a number of cases of mental disturbance following surgical operations leave much to be desired on the score of fullness and accuracy. In perhaps the majority of instances authors consider it sufficient to state that "insanity" followed the operation. However, enough is known to warrant the conclusion that several forms of mental disturbance, agreeing in the main with certain prominent clinical varieties of insanity, are met with as such post-operative sequels; but there is no special and distinctive form of post-operative psychosis.

There can be little doubt that in persons with emotional instability the shock of a grave operation may produce transitory delirium, or even more persistent mental aberration. The frequency of the so-called "transitory mania" at the moment of the completion of the second stage of labor is evidence that intense pain, combined with high nervous tension, is capable of producing it. The delirium attending severe injuries—"traumatic delirium"—may also in most cases perhaps be ranged with the cases of mental aberration from shock. Those cases of post-operative delirium or psychosis following immediately after the operation may be classed in this category. That other factors may concur in the production of this form of psychosis—*e.g.*, anxiety, worry, and the like—is probable. Ahlfeld reported a case of

violent mania following the introduction of a speculum, and Kiernan one consequent on the passage of a catheter in a man. In a small number of the reported cases no other essential factor than the shock and anxiety can be traced. From this form the patient usually recovers.

Among several thousand operations, only five cases of insanity observed, and two of these were insane before the operation; a third was in a state of senile dotage; in the remaining two the mania followed upon important operations and was quite inexplicable. The exaggerated fear of operation, which one often meets with in women, is an important factor in the production of mental instability, and is a contra-indication, when very pronounced. Bouilly (*Rev. de Chir.*, April and May, '98).

Gynæcological and ophthalmical operations are the two kinds most likely to be followed by post-operative insanity. The type usually observed under these conditions is a transitory form of acute mania, with mental confusion and hallucination. The majority of cases occur in persons over 40 years of age. The older the patient, the greater the chance of mental disorder. The majority of cases are of short duration, and do not require asylum treatment. Out of 40 cases, only 9 possessed an hereditary predisposition. There were 19 cases of melancholia. S. R. MacPhail (*Brit. Med. Jour.*, Sept. 23, '99).

A second class of post-operative insanity would appear to be due to the absorption of poisonous agents used before, during, or after the operation. It is now generally accepted that the acute mental disturbances, mostly hallucinatory in character, following operations upon the eye are due to the use of atropine and similar drugs. It is not improbable that some of the post-febrile psychoses are attributable to a similar cause.

These cases of drug poisoning with pronounced symptoms of mental disturbance are probably not so very rare as sequelæ of grave surgical operations,

particularly where extensive use is made of chemical antiseptics during the operation or in the after-treatment. The excessive use of opium, quinine, and other anodynes and antipyretics may with good reason be charged with some of the cases of post-operative insanity. The rare cases of mental disturbance following the administration of anæsthetics may properly be ranged under the same heading. One reason for this view is that in the large majority of these cases the symptoms are transitory and recovery promptly follows under appropriate treatment, the chief feature of which must be the withdrawal and elimination of the toxic agent.

An anæsthetic may be given to the insane with impunity, as a rule, when operations or examinations are necessary; but there is danger it may lead to a fresh attack of insanity if it is given to patients who have had previous attacks, and to those who are subject to recurrent insanity of any form. G. H. Savage (*Clin. Jour.*, Apr. 11, 1900).

A third class of cases of post-operative insanity I believe to be due to the absorption of septic materials from the wound or surface exposed during the operation. A study of reported cases shows that the insanity in most instances develops several days after the operation and is usually of the clinical variety termed "acute confusional insanity." The prominent symptoms are insomnia, restlessness, emotional instability; sometimes sudden, violent outbreaks, followed by incoherence, variable hallucinations,—especially of vision,—and sometimes delusions of grandeur or persecution. In most cases there are symptoms of fever, and usually marked implication of the physical powers. The pulse is rapid and weak, the temperature elevated, the tongue dry and red, and there is, usually, refusal of food. Exhaustion of mind and body rapidly intervenes, and the patient

sinks into a state of muttering delirium, coupled with great bodily weakness.

Le Dentu has collected sixty-eight cases of post-operative insanity—thirty-eight following operations upon the female sexual organs and thirty developing subsequent to general operations. Generally, he says, the mental disturbance begins from the second to the fifth day, although in some cases not until the twentieth or even later. He discusses the possible causes of post-operative insanity, but does not offer a solution of the problem. Bantock, in referring to a case of "hysterical mania" following four or five days after an hysterectomy, says there was "considerable tumefaction of the mammæ to account for the disturbance."

Excluding the cases due to shock, nervous strain, exhaustion, and drug-intoxication, which generally appear within the first twenty-four hours, it is probable that the majority, if not all, of the cases of post-operative insanity coming on within the first week are septic in origin. Puerperal insanity is now generally regarded as essentially a septic psychosis, and in this large and well-studied class of mental disturbances we have the closest analogy to most cases of post-operative insanity. It is possible that some of the acute cases following removal of the uterus or appendages are due to the sudden induction of the menopause, for so acute an observer as Krafft-Ebing considers the onset of the climacteric as a cause of acute delirium. Those cases of post-operative insanity coming on several weeks or months after removal of the uterus or appendages in women may be regarded as essentially cases of climacteric insanity (*q. v.*). The type is usually depressive. The cases that have been observed after extirpation of the testicles also usually present the melancholic type.

Prognosis.—The prognosis of post-operative insanity is that of confusional insanity generally; *i. e.*, while the death-rate from exhaustion is large, amounting to 12 or 15 per cent., the recovery-rate of the remainder is also large. The cases that terminate in secondary dementia probably do not exceed 10 per cent.

The tardy cases of post-operative insanity so-called—those that come on in women from six weeks to three or four months after removal of the uterus or appendages—give a less favorable prognosis. The recovery-rate in these cases is not over 50 per cent.: about the same as that of undoubted climacteric insanity.

Mental disturbance, developing soon after operation, seldom proves serious, while, when it appears a few months later, the prognosis is usually unfavorable. Jacobs (*La Policlinique*, Apr., '96).

Reports of 109 cases in which ablation of the internal organs of generation was undertaken for the cure of hysteria and insanity, or other neuropathic conditions. Only 17 were affected beneficially. The remaining 92 were either uninfluenced or affected injuriously. Insanity afterward developed in 44 of these women, 20 of whom had suffered from hysteria before the operation, while 24 had not. Twenty-three others who were insane and hysterical prior to the operation were worse after it. Two not previously hysterical had become so. The remaining 23, who had been in part insane and in part hysterical, remained in the same state after operation. Angelucci and Pieraccini (*Riv. Sper. di Freniatria*, p. 290, '97).

A systematic examination of all female insane patients, aided in nearly every case by anæsthesia, gave the startling result that 93 out of 100 insane women had pelvic disease. Eighty-nine were operated upon with the result of 37.5 per cent. mental recoveries; 22.5 per cent. improved; 35 per cent. unchanged; 5 per cent. of deaths. A. T. Hobbs (*Jour. Mental Science*, Jan., '98).

Sixty per cent. of the insane women personally examined had some abnormal condition of the pelvic organs, distinctly

pathological and easily recognized. The primary question is relief of local disease; the insane woman has the same right to treatment as the sane, and if such treatment is likely to benefit the mental condition it is our duty to carry it out. A summary of 34 cases shows 11 complete recoveries (mental and physical), 9 improved, 11 unimproved in mental condition, and 3 deaths. Rohé (*Jour. Mental Science*, Jan., '98).

Of 642 cases of hysterectomy and bilateral ovariectomy, only 4 personally observed in which the operation was followed by psychoses, and in all of them the patients were predisposed by inheritance or other factors. M. Segond (*Rev. de Chir.*, Apr. and May, '98).

Treatment.—In the developed psychosis the treatment heretofore recommended for confusional insanity is indicated. Much may doubtless be done in the way of prophylaxis. Strict aseptic precautions during operation, removal of all sources of irritation, both physical and psychical, in persons of neuropathic constitution requiring operation, and careful attention to nutrition in those broken down in health from long-continued, painful, or exhausting disease, will tend to diminish the number of cases of insanity following surgical operations. The use of chemical antiseptics and disinfectants in this connection also deserves attention.

There are many cases of women who have become insane through irritation of the ovaries who might derive benefit from surgery. The argument that the operation entails sterility on the women is of no weight, as such women are likely to bear unhealthy children and thus propagate their neuroses. Kroemer (*Therap. Monats.*, Apr., '96).

Insolational Insanity.

Definition.—Insanity following insolation, or sun-stroke.

Symptoms.—After recovery from an attack of sun-stroke many persons suffer from certain indefinable changes in their character. They are more irritable,

easily exhausted, especially in hot weather, and are liable to vertigo and other neurotic troubles. In a small percentage of cases insanity follows. This was already noted by Benjamin Rush, who reports two cases of madness caused by insolation.

The form in which insolational insanity occurs may be maniacal or depressive. In the former there may be sexual excitement with delusions of grandeur and untidy habits. The depressive form is usually attended by suicidal tendencies, delusion of persecution, anxiety, and hallucinations of sight and hearing. In some cases defective memory is the most notable psychical symptom. This may be accompanied by motor disturbances simulating general paresis.

Most writers who discuss insolational insanity class it with the traumatic insanities, assuming the evidences of meningeal inflammation, sometimes found, to be the causes of the mental disturbance. It seems to the writer, however, that the condition of the blood and vessels found post-mortem in cases dying of sun-stroke indicate such a profound change as can only be attributed to the action of a toxin. So it has seemed preferable to group the insolational psychoses with those due to toxæmia.

Prognosis.—Complete restoration of mental function is rare. A modified recovery, a partial dementia, is not infrequent.

Treatment.—This is purely symptomatic. Persons who have once suffered sun-stroke should avoid exposure during hot weather.

GROUP VII. PSYCHOSES DUE TO DEVELOPMENTAL CHANGES IN THE BRAIN. (See also INFANTILE MYXŒDEMA.)

Pubescent Insanity.

Definition.—Insanity occurring during the pubescent period of life.

By the "pubescent period" is not meant the arrival of the subject at the period of puberty, but the completion of the period during which the reproductive function is fully developed. This would include that period commonly called adolescence. The completion of this period in the female sex has been established by Matthews Duncan at about the age of twenty-five years. Clouston assumes this to be correct for both sexes.

There is a variety of periodical insanity beginning with puberty, coincident with disturbances of menstruation and ending when that function is regulated. It is to be differentiated from the usual forms of periodical menstrual insanity, and may be termed menstrual developmental insanity. Friedmann (Schmidt's *Jahrbücher*, Apr., '94).

Symptoms and Course.—By some authors a form of mental disturbance termed *hebephrenia* is described as the characteristic form of pubescent insanity. Hebephrenia is, however, in the majority of cases simply another name for the first stage of paranoia. It includes the cases of so-called "moral insanity," which is usually merely a stage in the development of paranoia (*q. v.*). Clouston, who has made a philosophical study of this period of life, both in its normal and its pathological relations, describes pubescent insanity as follows:—

"The insanity of puberty in both sexes is characterized especially by motor restlessness. Such patients never sit down by night or day and never cease moving. There is noisy and violent action, sometimes irregular movements, or, in the few melancholic forms and melancholic stages of the maniacal cases, cataleptic rigidity. The mental symptoms consist most frequently in a kind of incoherent delirium rather than any fixed delusional state. In boys the beginning of an at-

tack is frequently ushered in by a disturbance in the emotional condition—dislike to parents or brothers or sisters expressed in a violent, open way; there is irrational dislike to and avoidance of the opposite sex. The manner of a grown-up man is assumed, and an offensive 'forwardness' of air and demeanor. This soon passes into maniacal delirium, which, however, is not apt to last long. It alternates with periods of sanity and even with short periods of depression."

According to my observation, this is a true picture of the insanity of the pubescent period. The patients often recover in a short time after the beginning of the attack, but relapses are frequent. In girls, exacerbations are likely to occur in connection with the menstrual periods.

In those cases which do not recover, a mild form of dementia, resembling imbecility, follows. Maniacal states are, on the whole, more frequent than those of depression. When the latter are present they often have a religious tinge.

Masturbation, which most authors regard as an important concomitant, has probably little importance as a symptom.

Adolescent insanity is a pure psychosis, dependent upon hereditary factors and acquired conditions which especially inhibit the higher psychical centres and later the sensory motor functions of the cortex; masturbation is a complication which, in the male, is apt to cause reflexes; there is no period in life more important than adolescence. F. P. Norbury (*Nashville Jour. of Med. and Surg.*, Nov., '97).

Prognosis.—Authors usually give a very unfavorable prognosis in pubescent insanity. Excluding those cases, however, in which, from their symptomatology, belong to paranoia, I regard the prognosis as favorable. Under appropriate management pubescent insanity is a hopeful form of mental disturbance.

Clouston reports that about one-half of his cases recovered.

Treatment.—The treatment of pubescent insanity should be tonic and reconstructive. If the patient appears to be too active in movement, he should be put to bed and carefully fed. Weighings should be made weekly to determine the bodily gain or loss. So long as the patient gains, he is doing well; if he loses weight, it is the duty of the physician to ascertain the cause.

The tendency to sexual excitement and to masturbation should be counteracted in a moral way. The administration of anaphrodisiacs is generally followed by more harm than benefit. Mechanical restraint of the insane for any purpose is bad practice. It is better to allow a patient to masturbate than to put him in a straight-jacket, or confine his hands in a "muff."

Climacteric Insanity.

Definition.—Insanity occurring during the period of sexual involution in women.

Among the more serious accompaniments of the menopause is mental disorder. Statistics show that insanity in women is especially frequent between the ages of forty and fifty years. As this is also the ordinary period of cessation of the menses, the conclusion seems reasonable that some relation exists between the two conditions, although it must not be assumed that mental disturbances at this period are necessary consequences of changes in the functional activity of the sexual organs.

While insanity may come on in women who have ceased to menstruate prematurely, yet the majority of cases are coincident with the ordinary climacteric—from forty-five to fifty years of age. Single women are oftener affected than married women, and widows oftener still. A climacteric should be recognized

in men as well as women, though it usually is not. A large proportion of cases of climacteric insanity are associated with the use of alcohol. At first the usual clinical symptoms of the climacteric are exaggerated, passing into changes and accentuations in the individual—defective control, impulsive acts, hallucinations of sight, etc. Kleptomania is most commonly met with in the climacteric woman. The mental disorders are, in most cases, of a depressed type, melancholic and hysterical, with ideas of persecution. These ideas may pass into a definite melancholia, and many patients make an end of themselves by drowning, etc. In other cases with the expiration of the reproductive function there may be accentuation of lust or passion. The mania seen in such cases is generally a result of some abnormality in the reproductive organs with eroticism, obscenity, etc. Masturbation is very common. Next to melancholia, the most common form is delusional insanity with ideas of persecution. The prognosis of climacteric insanity is somewhat better than that of other forms—cases may last four or five years and yet recovery ensue. Fully organized ideas of persecution, lasting one or two years, are rarely recovered from. Contrary to the usual belief, the onset of the climacteric exerts no influence on insanity which has arisen previous to the menopause. Savage (*Lancet*, Oct. 31, 1903).

Symptoms.—Any of the clinical varieties of mental disorder may be present during the climacteric; but melancholia is most frequent. In 22 cases studied by Goodall and Craig, melancholia was present in 66 per cent. In 21 cases under my observation exactly the same proportion were of depressive forms at the time they came under notice. Bevan Lewis states that, at the early evolution of climacteric insanity, painful mental states invariably prevail, and in the large majority of cases mental depression exists throughout the attack.

Hallucinations of hearing and of smell

are frequent. Religious delusions color most cases. The class of cases termed by Savage "unpardonable sinners" are especially frequent among women who become insane during the climacteric. Bevan Lewis refers to these cases in the following terms: "Delusional states were recognized in 73 per cent., and out of a total of sixty-one deluded cases, sixteen were victims to the terrible delusion that the soul was eternally lost, and that the subject was to be consigned to the flames of hell. It is strange to witness the prevalence of this religious despondency at a period when, as we are aware, the generative organs are undergoing an important cyclical transformation, and to contrast it with the converse states of religious exaltation so frequently associated with the sexual transformation and excitation of adolescence, of hysterical and epileptic forms of insanity."

The fear of death, immediately impending or more or less remote, is often present. Frequently the memory and judgment are but little impaired, but the patients complain loudly of confusion of thought, fear they will become insane, will never recover, etc.

Delusions and hallucinations referable to the sexual sphere are common. Most cases of pseudocyesis occur during the climacteric. Fear of grave disease of the pelvic organs is often present. The subjective sensations of itching and burning in the external organs and the presence of leucorrhœa are probably the causes of this morbid fear. Actual disease of the sexual organs is, however, often present, and all cases should be thoroughly examined to determine this point. The great frequency of uterine cancer at this period of life must not be overlooked.

Delusions referred to the digestive organs are also present, although not characteristic. One case insisted that her

internal organs were all decayed, and that therefore it was useless to give her food or medicine. If she had a stomach, she might possibly recover, but as this organ had been entirely destroyed there was no possibility of ever getting well. Another case insisted that her entrails had been taken out and thrown to the chickens. On her admission to hospital she refused food, but after several days' forcible feeding she began to eat and improved rapidly in her physical condition. Her delusions gradually disappeared and she was discharged recovered after two months' treatment.

Delusions of grandeur are sometimes present in the maniacal and paranoiac cases.

Suicidal tendencies are frequent, although usually not so persistent as in melancholia generally. In one case, however, the patient set fire to her clothing "to escape from the devil," and was so severely burned as to result in death. Lewis refers to a case in which an attempt at self-destruction was made to escape a similar alleged danger. The apprehension of death by fire is frequent.

In some cases the depression and mental anxiety lead to the use of alcoholic stimulants, resulting often in confirmed intemperance.

While there is no specific form of mental disorder that can be properly termed "climacteric insanity," there can be no doubt that the menopause must be considered as one of the exciting causes of mental disease.

The relation between insanity and disturbances of the sexual function due to pelvic disease must be considered in treating the insane. When such disease is suspected, a thorough examination should be made. In investigating criminal acts committed by women with irregularities of menstruation due allowance should be made for their influence on the mental condition. The

special dangers of the climacteric as regards the development of melancholia must be remembered. Macnaughton-Jones (Brit. Gynec. Jour., No. 2, 1900).

Some writers devote much attention to the consideration of a climacteric insanity in the male sex, but there is no period in the life of man that corresponds with the menopause in women. The parallel that has been drawn between the period of involution of the sexual power in man and the climacteric period in women is, as Bevan Lewis says, "more fanciful than strictly correct."

Prognosis.—The prognosis of the insanities of the menopause is, according to authors, rather favorable. In my cases, including even those who had already passed into dementia when they came under observation, the recovery-rate was 43 per cent. Goodall and Craig had 38 per cent. of recoveries; Sutherland a fraction over 40 per cent.; Lewis 48 per cent.; Merson nearly 50 per cent.; Skae 53.5 per cent., and Clouston 57 per cent.

Death is rare as an immediate consequence of the psychical derangement. Suicide and marasmus in those cases refusing food form the largest contingent of deaths in the acute condition. Among the chronic cases, tuberculosis claims the largest share in the death-rate.

Treatment.—The treatment of the mental disturbances of the menopause often tests severely the patience as well as the therapeutic resources of the practitioner. Refusal of food often depends upon delusions, but at times disorders of the *primæ viæ* are responsible. In the latter case stomach-washings, laxatives, and intestinal tonics such as nux vomica and physostigma are indicated. Where the reluctance to take food or its absolute refusal depends upon delusions that the food is poisoned or that the viscera are decayed, forcible feeding must generally

be resorted to. In cases of aggravated gastric catarrh the subcutaneous infusion of a nutritive saline solution heretofore recommended will often be beneficial. After a few days' rest the stomach will take up its functions with renewed vigor.

The præcordial anxiety and palpitation of the heart, if troublesome, will generally yield to moderate doses of Hoffman's anodyne. For insomnia, paraldehyde is probably the least harmful hypnotic that can be used, although, where its odor and taste are objectionable and there is no cardiac weakness, trional may be substituted.

The physical depression needs good food, fresh air, and tonic medication. In states of great weakness absolute confinement to the bed is necessary to prevent exhaustion.

Symptoms referable to the sexual organs are not always evidence of delusion, and should not be so declared until a careful physical examination has shown the absence of local disease.

Mental depression is best combated by cheerful surroundings, out-door life, and medicinally by opium. This drug should be given systematically, as recommended in melancholia. Cannabis Indica and belladonna are also at times useful. Cocaine has been recommended, but is dangerous on account of the tendency to establish a habit.

The good effects of thyroid extract reported, especially in melancholia, encourages to further trial with it.

The depressive hypnotics and sedatives—such as chloral, bromides, sulphonal, antipyrine, etc.—should generally be avoided in depressive mental states.

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INSECT-BITES AND STINGS. See WOUNDS, VENOMOUS.

INSOLATION.

Synonyms.—Sun-stroke; heat-stroke; thermic fever.

Definition.—The terms “insolation,” “sun-stroke,” “heat-stroke,” and “thermic fever” are applied to a series of symptoms occurring as the result of exposure to undue heat of the whole or parts of the system, while the latter is in a condition of physical debility, and resulting from intoxication by products of metabolism.

Symptoms.—The symptoms vary in intensity and nature, and three forms of insolation are recognized: heat-prostration, heat-apoplexy, and thermic fever.

HEAT-PROSTRATION.—This form is frequently observed in cities during summer-heat, especially in persons in whom the powers of resistance have been weakened by alcoholism, ill health, and overwork. It is also the variety of insolation usually observed in soldiers, and is especially marked in men unused to marching or who are laboring under a malarial toxæmia. These two associated varieties as described by de Santi illustrate thoroughly the series of phenomena most frequently met with in active practice.

In the form characterized by individual weakness, the man who has so far marched well becomes silent, unbuttons his coat, and, if asked, complains of violent headache and oppression; but he continues his march up to the moment when he becomes pale and falls, with convulsive movements, as if in an attack of epilepsy. The teeth are firmly closed, the insensibility is absolute, the respiration difficult, the pulse small and irregular, and he often urinates involuntarily. A waxy pallor of the face appears also.

The patient moans, he streams with sweat, he drags in the rear, and if he continues his march he becomes still paler, while his lips become cyanosed;

the jugular and temporal veins swell; the eyes become injected; the respirations shallow and quick, until the sufferer falls gently to the ground. He generally does not entirely lose consciousness, and, when he is laid down and relieved of everything which interferes with respiration, breathes deeply and quickly becomes himself again. Sometimes, however, on coming around, various nervous symptoms, usually not important, supervene.

The malarial form generally occurs in old soldiers who have long struggled with paludism. The man marches badly on starting, but becomes more animated as he goes along. His face is red, he does not seem to feel the fatigue, but is thirsty; suddenly, as if struck down by a club, he falls face downward in a state of absolute coma. Here, generally the face is turgid, but sometimes it is pale. This state may last for hours,—twenty-four or thirty-six,—and may terminate in death without recovery of consciousness.

Series of 31 cases: in 19 the heat predisposing to the attack was solar, in 11 it was artificial, while in 2 both factors were at work. The highest temperature attained was 112° F., more of the cases having temperatures, upon reception, between 110° and 111° F. than between any other two degrees. Twenty of the cases were unconscious, 8 were conscious, and 3 were partially conscious, while 4 were wildly delirious. Consciousness was maintained in every case where the temperature was below 108° F., except in one, where the temperature was 102.4° F. The pupils in 24 cases were extremely contracted, in 5 they were natural, in 1 they were sluggish, while in 1 only they were dilated. Where the pupils were contracted there was also present unconsciousness, except in 3 cases, and in these the temperature was 106° or over. Convulsions occurred in but 6 cases. The pulse varied much in different cases, being invariably absent

at the wrist, where the temperature reached 108° F. Respiration in almost all cases was accelerated. Color of the face varied from flushed in the lighter cases, to livid and mottled in the cases with marked alteration in respiration and circulation. Involuntary evacuation of liquid, offensive stools was present in many of the cases, with the typical mousy, repulsive odor characteristic of these discharges. The longest time required to reduce temperature to within safe limits was within one hour, the average time being from ten to fifteen minutes. The prognosis could be made easily from the facility with which the temperature was reduced. The mortality in the whole series was 12 out of 31. The manner of death was, as a rule, by almost simultaneous cardiac and respiratory failure. F. A. Packard (*Amer. Jour. Med. Sci.*, June, '88).

The temperature, at first subnormal, generally rises, especially in mild cases, to below 102° or 103° F. Recovery usually takes place in a couple of days under proper treatment. Mild cases may recover in a few hours.

The sequelæ most frequently observed in cases of heat-exhaustion are undue sensitiveness to even moderate temperatures; acceleration of the pulse and respiration; disorders of digestion; headache and vertigo; tenderness of the spine. Chromatopsia; irritability of disposition, particularly recurring with the onset of warm weather. Epilepsy and disorders of locomotion and sensation have also been observed. Impairment of memory and of the general aptitude are often observed.

The reflexes were, as a rule, exaggerated in a series of cases observed among soldiers. In 4 cases, epilepsy appeared after the insolation; in 2, partial hemiplegia; in 9, cutaneous anæsthesia; in 3, hyperæsthesia. The mental faculties were impaired. In the majority, memory was enfeebled. One case presented marked muscular tremors; in 27 there

was deafness. Twenty-six presented impairment of vision. Sighing respiration was a not infrequent manifestation. In 14 cases the heart was irritable; in each of 15 a cardiac murmur was heard. In many of the cases the murmur was dependent upon the anæmia; in some it was organic. In some cases the heart was irregular or intermittent. Barlow (*Cincinnati Lancet-Clinic*, June 6, '91).

Case of a laborer, 31 years old, who, while at work, in midsummer, lost consciousness. For some five weeks he was delirious. During convalescence there was difficulty of speech and impaired motility and sensibility in the extremities. The man could not whistle; there was slight drooping of the lower lip on the left side; there was wasting of the muscles of the shoulder, and fibrillar tremor of these and of the biceps and triceps; if the arms were grasped below the elbow a coarse, purring thrill was felt; the muscles of the buttocks, of the thighs, and of the calves also presented fibrillar tremor; there was slight tremor of the lips and marked tremor of the tongue; there was persistent, dull, aching pain in the dorsal and lumbar regions; the knee-jerks were, perhaps, slightly subnormal; the muscles presented slight quantitative electric changes; the sphincters were competent; the hands and feet were cold and livid. Two applications of the white-hot cautery to the back were followed by a disappearance of the pain and by decided improvement in the symptoms. *Dercum* (*Univ. Med. Mag.*, June, '91).

Case of insolation accompanied by hemiplegia in a boy aged four years. Arthur F. Messiter (*Lancet*, June 26, '97).

HEAT-APOPLEXY.—This form is much less frequently observed. It resembles to a great degree the variety of heat-exhaustion occurring in people suffering from malarial poisoning. Dizziness, intense local headache, the appearance of *muscæ volitantes*, marked throbbing at the temples, dryness of the skin, and dyspnœa are the most usual premonitory symptoms. Suddenly the sufferer falls,

convulsions occur, followed, occasionally, by all the symptoms of cerebral hæmorrhage, barring the hemiplegia, but ending with cardiac failure.

In the majority of cases, however, this stage is not soon reached. Besides the first symptoms outlined, there is marked flushing of the face, which may extend to cyanosis; the breathing is stertorous; there is marked delirium; nausea and vomiting or, rather, retching, and the tongue is coated. In these cases the temperature may also be subnormal at first, but it usually rises until it sometimes reaches 115°, 116°, and even higher.

In moderate cases the temperature gradually falls and in three or four days the patient is able to go about. He is, however, very apt to suffer from either or many of the sequelæ already enumerated.

THERMIC FEVER OR HYPERPYREXIA.—This is an aggravated form of the preceding and is not infrequently witnessed. It is characterized by excessively high temperature—sometimes 115°, 116°, and even 117.8° F., as in the case observed by Lambert. This means death, preceded by intense dyspnœa, asphyxia, and coma in the majority of cases, but by no means in all—under proper treatment.

In a considerable proportion of cases there are preliminary symptoms which, if accepted as warning, might prevent the development of the more dangerous features—nausea, cramps, progressively increasing weakness, vertigo, blurred vision, intense headache, and cessation of the perspiration. If these symptoms do not cause the patient to realize that he is in danger, and to repair to a cooler spot—the active symptoms of thermic fever appear. The skin, from dry, becomes flushed, red, and burning; it may finally assume a bluish tinge, while the

mucous membranes become markedly cyanotic.

A thermometer left *in situ* would indicate that the temperature is steadily rising, and though perhaps subnormal at first, reaching down as low as 95°, it may reach the temperature already mentioned. The pulse follows the temperature, and is at first full, bounding, and non-compressible, then becomes rapid; the number of respirations also follows suit, varying from 20 to 60 per minute. The eyes are watery and fixed, and the pupil is contracted.

Clonic spasms, alternating with rigidity, are often observed. There is moaning, delirium, and jactitation, unconsciousness usually accompanying these symptoms. The urine and fæces are passed involuntarily,—though the secretions are sometimes totally suppressed,—and exacerbations of dyspnœa, noticeable from the start, gradually assume the state of asphyxia, followed by death.

A fatal issue does not always follow, however; and the use of appropriate means, especially the cold bath, often saves patients whose temperature has reached extraordinary limits.

Case of "electric sun-stroke" observed.

The patient had been engaged some twenty minutes in adjusting the screw which separates the carbon points of an arc-lamp, his face being held some 15 to 20 inches or more from the arc, and had neither covered his eyes with smoked glasses nor taken any precaution against radiation. The current was 12 to 14 am-pères, with a potential of 44 volts, and the lamp had an illuminating power of about 200 Carcel burners. Two hours and a half later the man supped with good appetite, and three hours after this went to bed and slept soundly, as usual. About midnight he was awakened by feelings of insupportable pain and burning in the face, and especially the eyes. He was unable to see, covered his eyes, and complained of great scorching, which

was aggravated by the least access of light. The lids and conjunctivæ were red and swelled, with muco-purulent discharge. With pain he distinguished between light and darkness, but could not distinguish objects. The entire face was reddened, especially around the eyes. Recovery took place under the following treatment: Belladonna ointment around the eyes and to the lids; cold compresses to the eyes; occlusion; hot foot-baths; saline washes, with, later, the addition of Van Swieten's solution. Prat (*Archives de Méd. Navale*, Dec., '88).

Diagnosis.—The special conditions attending these cases and the character of the symptoms render diagnosis easy in almost all cases.

ACUTE ALCOHOLISM.—In this the odor of alcohol and the previous history of the case render diagnosis easy.

CEREBRAL HÆMORRHAGE.—This is probably the disorder for which insolation is differentiated with some difficulty. The absence of hemiplegia is considered as reliable sign by Flint.

Three types of sun-stroke specified. The cerebro-spinal, characterized by symptoms of intense congestion—by injection of the face and conjunctiva, by stertor, coma, and convulsions; the syn-copal, or cardiac, type, made manifest by pallor of face and profuse perspiration, death taking place by arrest of the heart; and the pulmonary form, in which, in addition to some of the symptoms pertaining to the other two there are anxiety, dyspnœa, and asphyxia. Sun-stroke usually arises under conditions of mental or physical overactivity in conjunction with undue exposure to heat and a suppression of the secretions, the disease being dependent upon retention, in the system, of toxic products of retrograde metamorphosis. Martin (*La Sem. Méd.*, Sept. 16, '91).

Etiology.—Excessive heat in any form is usually considered as the main factor in the production of insolation. It may not only occur in the street, but also in a boiler-room, a laundry, etc., showing

that heat is the predominant factor. Heat-exhaustion may be brought about by excessive exertion under unfavorable conditions, while sun-stroke is due to excessive heat and occurs during the hottest season of the year. The latter exhibits remarkable endemic characters, in that it is extremely prevalent in one locality, in another is totally absent, though the region may be quite adjacent and under precisely similar climatic influences; again, its ravages in different years vary immensely and quite irrespective of heat. (Sambon.)

Exercise strongly favors production of heat-stroke. Excessive temperature acts directly on the nervous system, and not by inducing autointoxication or coagulation of muscle-fibre. Laveran (*Bull. de l'Acad. de Méd. de Paris*, Nov. 27, '94).

Insolation is due, not to discrete local lesions, but rather to some direct effect on the brain as a whole. Jackson (*Boston Med. and Surg. Jour.*, Feb. 4, '97).

According to Phillips, meteorological conditions predispose to sun-stroke, and these involve high temperature, relative humidity, wind, and climatological characteristics, as well as the direct rays of the sun. The attack is no more dependent on high temperature and direct insolation, he thinks, than it is on low relative humidity.

The reduction of physical resistance to the action of heat upon the nerve-centers and a secondary disturbance of metabolism probably at the bottom of these cases. Thus fatigue,—mental and physical,—insufficient food, unsanitary surroundings, and worryment are all noted as predisposing factors. Alcoholism is particularly active in this respect.

The colonial governments of Australia having asked the medical board to issue appropriate instructions as to prophylaxis from sun-stroke, the fact was elicited that, of all predisposing causes, undue indulgence in intoxicating liquor is the most common and the most dan-

gerous. Further, that during the attack it is dangerous to employ intoxicants as a remedy. Editorial (Brit. Med. Jour., June 20, '96).

Clinical and pathological study of 805 cases in which the main factor was shown to be an autointoxication, with heat as a contributing cause. Lambert and Van Gieson (Medical Record, July 4, '97).

Of 465 cases whose histories were known out of a total of 841 cases, 30 per cent. were alcoholic, 50 per cent. moderate drinkers, and 20 per cent. teetotalers; while of 70 deaths, 60 per cent. occurred in alcoholic patients, 30 per cent. in moderate drinkers, and only 10 per cent. in teetotalers. Phillips (Inter. Med. Mag., Aug., '97).

Males are more frequently affected than females, and children—though less frequently attacked—are not free from the disorder, especially when the head is exposed to sun-rays.

Three cases of thermic fever in infants, each about one year old. The cases developed during the heated term, amid the most unfavorable surroundings. Each presented vomiting, diarrhoea, high temperature, and symptoms of profound depression. The cold wet-pack was used in treatment, with most successful results. Illoway (Med. News, Aug. 8, '92).

Convulsions and even death caused by allowing children to walk about in the water at the sea-shore with their clothes tucked up, their feet chilled, and their heads exposed to the blazing sun. Whitfield (Brit. Med. Jour., Aug. 8, '96).

The majority of cases occur in the afternoon, though cases are not infrequently observed at night, especially in poorly-ventilated quarters. In stoke-holes, boiler-rooms, sugar-refineries, etc., where the heat is intense, heat-strokes may occur at any time.

Pathology.—After a study of eight hundred and five cases of insolation, Lambert and Van Gieson found that heat alone is not sufficient to explain all the clinical and pathological observa-

tions. The prodromal symptoms of sun-stroke are those of acute functional disturbance, while the later symptoms, much more serious, point to grave changes in the blood and in all the nerve-centres, especially those of the latter which control the thermic mechanism of the body.

Van Gieson examined the brain and cord in several of Lambert's fatal cases, and found universal exhibition of acute degeneration of the neurons of the whole neural axis. In the cerebral cortex and cerebellum the cells showed the same degenerated changes; the cells of the spinal cord were not so extensively involved. The toxic agency of the symptoms of insolation seem to be shown by the changes found in the ganglion-cells. They were, in every way, similar to those produced by a number of other poisons, such as by alcohol, lead, etc., and by bacterial products.

The experiments by Vallin would tend to show that coagulation of the albuminoid bodies occurs. The toxæmia would thus occur as a result of arrested metabolism. The blood is dark, though fluid, and the corpuscles are crenated. In the hyperpyrexial form leucocytosis and degeneration of the red corpuscles may also be noted. Extravasations in the peripheral tissues are often found, and the body undergoes rapid putrefaction.

According to de Santi, insolation is in all cases characterized, from a pathological point of view, by arrest of the heart, but dependent on different causes. These may be classified as arising from intoxication by the products of muscular effort; from asphyxia; from a malarial infection called into activity by fatigue or heat. In the first form, that of intoxication by the products of muscular exertion, the victims are chiefly among

soldiers unaccustomed to the fatigue of a march. The attacks occur when the temperature is high and the air is calm and humid; so that the cutaneous evaporation is small. Sambon has emphasized the microbic origin of insolation.

The following is a description of the micro-organism found in the blood of patients suffering from heat-apoplexy and regarded as the specific cause of that disease. It is linear, incurved, and slightly constricted in the middle. Viewed in the blood, it is from 2 to 2.5 microns long, and 0.5 micron thick; in cultures it is somewhat larger. It presents filaments, is slightly motile, but possesses no cilia, stains easily with aniline colors, but not by Gram's method. There are free spores in the cultures as well as in the rods. It is aerobic, does not cause fermentation in sugars, and does not give rise to indol. It grows between 30° and 37° C., but is instantly killed by a moist heat of 70° to 75° C. Cagicol and Lapierre (Montreal Clinique, Apr., '98).

Siriasis is unknown in many of the hottest countries of the world. Many critics have confounded the disease with ordinary syncope. The destruction of the red blood-cells in siriasis points to a toxic element in the blood of microbic origin. Sambon (Brit. Med. Jour., Sept. 9, '99).

In the British army in India heat-stroke is most fatal and most prevalent where the heat is greatest and most oppressive, and at the time of the year when these influences are at their maximum. It will require much more evidence than has yet been produced to make those who have had experience of the disease in India accept a microbial or other cause which seeks to minimize the great and predominating influence of fierce and continuous heat. W. J. Buchanan (Lancet, Sept. 15, 1900).

Treatment.—Hydrotherapy and skilled and careful nursing seem to be the chief factor, in treatment of insolation; frequent recording of the temperature en-

abling the baths to be given at the earliest and, therefore, most effectual time; the use of the ice tub-bath, with constant and general friction of the entire surface, thus reducing the temperature in the shortest possible time, and being stimulating rather than depressing; the use of the same bath for all severe secondary elevations of temperature, and for the minor elevations sponge-baths of ice-water or of water at from 70° to 80° F., depending upon the individual case; and the repetition of these baths whenever the temperature is high enough to make them seem advisable. All other means have seemed entirely inadequate to N. R. Norton.

At St. Vincent's Hospital, New York City, the following method of treatment of insolation has given good results. It is given here as detailed by G. F. Chandler, because it seems most in accord with modern views as to the pathogenesis of insolation. The ambulances are well supplied with ice, which is kept about the patient's head from the moment he is picked up until he enters the hospital.

Upon admission the patient is immediately stripped. His temperature, per rectum, is taken as he is being placed upon a raised stretcher or table.

The body of the patient is covered with a sheet, upon which are placed small pieces of ice. Large quantities are laid closely about the head. Ice-water from dippers, at a distance of from five to ten feet, are dashed with force upon the patient. This is continued about thirty or forty minutes.

The most efficacious stimulant, and one which has served to arouse when everything else has failed, was the pouring, from an elevation, of a fine stream of ice-water upon the forehead. As this treatment is very radical, it is continued for only one or two minutes at a time.

In severe cases it is repeated several times, unless consciousness returns.

While this is going on, each patient, with very few exceptions, is given hypodermically 40 minims of the tincture of digitalis at one dose. Exception is in the case of the plethoric patients with great arterial tension. Upon such patients venesection is practiced, and later tincture of digitalis is given in smaller doses.

The temperature is carefully watched, and when, after hyperpyrexia it reaches 104° F., the patient is laid in a bed, covered with blankets, and hot bottles are placed about him.

When the temperature is reduced to 99° or 100° F. by bath, as is usually practiced, clinical history shows that it nearly always becomes subnormal—even falling at times as low as 91° F.—and leaves the patient in collapse. When the temperature is only reduced to 104° F. it will, in most cases, continue downward of its own accord.

Strychnine is never given. It has proved upon trial to cause convulsions or make them more violent. Convulsions are treated by chloroform.

When the secondary rise of temperature occurs, a sheet, wrung from ice-water, is spread over the patient, and kept wet until the temperature becomes normal. In some of the cases, where the secondary rise is very rapid, the entire ice-and-water treatment is repeated several times, or until the temperature remains normal. An ice-cap is kept upon the head from the time the temperature becomes normal until the patient is dismissed. This has been found of the utmost value.

In cases of prolonged unconsciousness patients are nourished and stimulated by means of the stomach-tube.

In extreme cases hypodermics of whisky are used.

As death seems the result of respiratory paralysis, artificial respiration is kept up for long periods of time—often half an hour or more. Surprising results are sometimes obtained.

The after-treatment consists of light diet, stimulants, fresh air, the ice-cap, and sudorifics, such as ammonia—preferably the spirit of Mindererus—in large doses.

Preference expressed for the wet pack over the cold bath in the treatment of heat-stroke. The wet pack does not produce so rapid a depression of the temperature; but, on the other hand, it is not followed by a secondary elevation. A large muslin sheet is wrung out of cold water; the patient wrapped in the sheet, placed in bed, and covered with a blanket. As soon as the sheet becomes warm it is removed and replaced by another that had meanwhile been cooling in the water. This procedure is continued until the temperature reaches the normal. Illoway (*Med. News*, Aug. 8, '91).

During convalescence, if pulse bounding, veratrum viride and bromide of sodium useful; if pulse weak, ergot. Counter-irritation to the nape of the neck where evidences of meningeal irritability exist. If surface of the body is very cold, high injections of cold water into the colon, reducing heat and driving congested excess of blood to the surface. If heat-exhaustion occurs in which there is an unusual fall in bodily temperature, hot injections or baths. E. C. M. Page (*St. Louis Clinique*, June, '95).

Ice-baths and the ice-cap resorted to, but antipyrine employed to keep down temperature. Smyth (*Brit. Med. Jour.*, Jan. 9, '97).

The ice-pack and ice-cap recommended, and ice-water dashed with force from dippers at distances of from eight to ten feet for thirty or forty minutes if necessary. The most efficacious stimulant, though it can be applied only one or two minutes at a time, is a fine stream of ice-water poured from an elevation upon the forehead. Finally, most pa-

tients are given subcutaneously 40 minims of digitalis at a dose; unless the sufferer is very plethoric, in which case venesection is practiced, and the fox-glove given later on in smaller doses. O'Dwyer (N. Y. Med. Jour., June 5, '97).

Great relief is obtained in cases of heat-exhaustion from the application of cold over the spine. In sun-stroke the cold bath, rubbing with ice, blistering, shaving the head, and the use of antipyrine is advocated; although these measures cannot compare, in the writer's estimation, with the effects of heat applied over the last four cervical and first four dorsal sympathetic ganglia. The application of heat to this region and of cold to the head, and also the inhalation of oxygen have been followed in his practice by the best results. Kinnear (Med. Record, Aug. 21, '97).

In thermic fever in infants the ice-bath condemned. In the milder form sponging the body with hydrant-water and the administration of more water internally is all that is required. In the severe forms a bath, the temperature of which is not below 60° F., may be used; at the same time friction should be vigorously applied to keep the peripheral arterioles dilated. Stimulants may be given as required. In the hyperpyrexial forms it is well to make the skin intensely red, as by nitroglycerin, friction with towel or hand, or a mustard bath; then even sponging with hydrant-water will rapidly produce the desired result. Spraying cold water on the patient has been found to be the most effective treatment. The water should not be too cold. For convulsions and tonic spasms chloroform is important. Free perspiration should be induced as soon as possible. Diuretics act well by assisting the elimination of waste-products. Nux vomica should not be administered, as it may only be synergist to the toxin. Water should be given as soon as possible and freely administered until convalescence. John Zahorsky (Pediatrics, No. 4, '98).

A watery solution of antipyrine (1 to 2) should be carried in the pocket for instant use when there is danger of encountering cases of sun-stroke, and as soon as the patient is seen 20 minims

should be administered hypodermically. Lewis (Phila. Med. and Surg. Reporter, July, '98).

In the Indian territorial service, when sun-stroke occurs in the open, the subject is at once removed to a cool and shady place, placed in a recumbent position, with the head slightly elevated, to which cold applications are made. The chest and shoulders are stripped and cold-douched. Then hypodermic injections of the following are made in different places about the shoulders:—

R Quin. sulph., 5 grains.
Acid. sulph. dilut., 5 minims.
Aque, 50 minims.

M. et ft. liquor.

Should the heart's action be weak, the following is used, hypodermically:—

R Strychninæ sulph., 1 grain.
Aque, 200 minims.

M. et ft. liquor.

Sig.: Inject 5 minims (equal to $\frac{1}{4}$ grain) p. r. n. C. Fitz-Henry Campbell (Med. World, Aug., '98).

Case of a stoker on a transatlantic liner who suddenly collapsed owing to the extreme heat, and was brought on deck unconscious and in a state of most violent convulsions. The patient being apparently about to succumb to respiratory and cardiac paralysis, venesection was tried as a last resort. After eight ounces of blood were allowed to flow, instantaneous relief was obtained. Klein (Münchener med. Woch., July 3, 1900).

Heat-exhaustion requires rest and stimulation, head low, and body recumbent. If able to swallow, an ounce of brandy and 20 drops of tinctura opii should be given at once. If unable to swallow, a large dose is to be given per rectum, or whisky and tincture of digitalis hypodermically. No ice or bleeding is to be used. Heat-fever is treated in different ways: ice-cold pack, cold douche. In India the patient is removed to the shade, and cold water is thrown on him after removing all clothing. Cold water is to be thrown into the rectum. If depression comes on, stimulation should be resorted to. If convulsions appear, hypodermic injection of morphine is of value. Ice should be

put to the head, hot bottles to the feet, and ice-bags to the spine. Bleeding may be of use. C. C. Herman (Penna. Med. Jour., Dec., 1900).

Studies of 92 cases of thermic fever. The best method of applying cold was apparently rubbing with ice. In those cases in which there was no decrease in the symptoms corresponding to the fall of temperature bleeding was found to be of benefit. It was employed in 8 cases, with 4 deaths. The quantity withdrawn varied from 6 to 20 ounces. Hypodermoclysis was employed in 28 cases of the severest type, and only 1 died. As, however, the normal saline solution entered the circulation too slowly, intravenous saline injections were used in 10 cases, with 4 deaths. No infection occurred. In certain cases not improved by the hypodermic method venous section and transfusion may be employed. Lewis and Packard (Amer. Jour. Med. Sciences, Sept., 1902).

INTERMITTENT FEVER. See MALARIA.

INTERNAL EAR, DISORDERS OF.—

The percipient apparatus of the ear is relatively rarely affected and furnishes but 2 to 10 per cent. of the cases in the statistical tables,—the larger figure embracing apparently every case which gives evidence of nerve-involvement, however secondary in fact and importance to tympanic trouble. It comprises the congenital defects as well as the central lesions, such as nerve-atrophy in tabes, word-deafness from cortical lesion, and many other rare cerebral affections; but the group which most concerns us in this practical review is made up largely of lesions of the labyrinth due to the specific affections, including syphilis.

Tuning-fork Tests.—The diagnosis of these affections is largely from negative evidence, much of it furnished by the tuning-fork tests of the function; and these had better be here considered.

Tuning-forks can be conveniently used, giving tones due to vibrations of from 50 to 2000 per second, and much can be learned by use of $A = 213$ v. s. or $C = 520$ v. s. alone; but it is not best to trust to any one tone. The lower forks must usually have clamps to dampen the overtones (such can be improvised by slipping bits of rubber-tubing over the ends), and in the absence of such will often give the notes one or two octaves higher coincidentally with the fundamental. For this reason and for its convenient duration of vibration I prefer the $A = 213$ v. s., of medium size, more often found in the shops. Such a fork, struck upon some rather soft surface by falling its own length, should generally be heard some 90 seconds through the air when held before the ear; while with its handle resting upon the mastoid or other portion of the skull or face it should be audible slightly less than half as long. It should be heard equally in each ear from points in the middle line of the head; and the sound-waves should escape from each canal, as can be heard through the auscultation-tube. Stopping the canal with the finger should increase the sound in the closed ear to a degree that extinguishes its perception in the other and makes the sound again audible by bone-conduction after it has been lost normally. Low tones are heard better relatively by bone; high tones by air; so high-pitched forks should have long handles if their use on the mastoid is to be free from possible fallacy. Low-toned forks should be lightly struck to test bone-conduction, lest their vibration on the head should be oppressively loud.

If we place the vibrating A-fork on one mastoid it should be heard for some 40 seconds, as stated, and for some 50 more when transferred to the front of

the canal; and each other fork has its fairly-definite proportion for a normal ear, equal on the two sides. But in deaf ears the finding will be different and discrepant perhaps on the two sides. Lesion of the conducting-apparatus will impede alike the entrance of sound-waves by air and their escape from the tympanum when awakened there through bone-conduction. Hearing by air-conduction will be subnormal, by bone-conduction it will be exaggerated; the proportion changing from 90:40 to perhaps 30:50, bone-conduction preponderating. This is Rinne's or Schwabach's test,—modified by Roosa very practically by merely noting whether it is "louder front? or back?" as almost any patient can rightly decide.

If the deafness be due to the percipient apparatus, the normal preponderance of air-conduction will continue, bone-conduction being relatively worse, or, perhaps, totally lost. The proportion may now be A. C. 40: B. C. 10. So, too, from the middle line of the head the hearing will be worse in the worse internal ear, whereas if the trouble be in the conducting apparatus the more obstructed ear will be the one hearing louder by bone-conduction. This is Weber's test.

Gardiner Brown modified Weber's test by resting the tuning-fork on the bridge of the nose and having the patient raise his finger just when he ceased to hear its vibration. As this should be exactly when the vibrations ceased to be felt by the fingers of the examiner, a rough, but practical, measure is gained (for each ear if unequal) of the increase or decrease of the bone-conduction, and the result is conveniently stated as + 3 seconds, — 4", etc.

Cases will frequently be met where these tests give uncertain or contradictory results. Patients will give their preconceptions instead of observing the

actual perceptions, unwilling to say that they hear by bone louder in the ear which they know to be worse or confusing palpable vibrations with their weakened auditory perceptions. A deaf-mute will often claim to hear the fork as well resting on the patella as when on the mastoid. Yet a little patience and variation of the tests will generally clear up contradictions. The high tones are later and in less degree lost in tympanic affections, unless thickening of the drum-head shut out some such sound tone as the impure of the watch-tick.

The catarrhally deaf usually hear relatively or even actually better in a noise, — "paracusis Willisii"; whereas those with nerve-deafness are made worse by it. Very high tones, such as given by the Koenig rods or the Galton whistle, may be inaudible to a diseased labyrinth or portions of the gamut may be lost, while all voice-tones, as well as much deeper notes, are normally heard. These limitations must be learned and borne in mind; then the tuning-fork tests will generally be found to lead to correct diagnosis; and the many instances of mixed affection will be noted as well as those which are totally differentiated.

In affections of the Eustachian tube and in those of the external aural ductus, the sound of a vibrating diapason is always heard on the shut or impaired side stronger than on the crossed side. In cases of disease of the tympanic cavity without involvement of the acoustic nerve it is always heard from the direct side, though one side is more impaired than the other. In cases of diseases of the tympanic cavity with hyperæsthesia of the acoustic nerve, or in cases of this condition only, the sound is heard from the hyperæsthetic side, but stronger on the crossed side. In cases of disease of the internal ear (atony or atrophy of the acoustic nerve), with or without impairment of the tympanic cavity, the perception of the crossed sound is abolished,

while sometimes the direct sound continues (although very weak). Masini (Bollettino delle Malattie della Gola e del Naso, July, '88).

Ability to hear the voice at a distance proportionately greater than the distance at which the sounds of a clock can be heard is a symptom of disease of the cochlea or of the acoustic nerve. Four principal types of cases may show a disproportionate relationship in the ability to hear these two classes of sound: 1. Aphonic voice and clock with strong tick heard at about the same distance: a rare type appearing in slight affections of the sound-conducting apparatus. 2. The voice heard about three times farther than the clock: a more frequent type, found in nerve affections of the sound-conducting apparatus. 3. The voice heard at a still greater distance: fifty times farther than the clock, as in disease of the inner ear in young subjects. 4. The clock heard farther, sometimes ten times farther, than the voice: a rare type seen only in hysterical conditions and quite characteristic of this affection. Gradenigo (Annual, '96).

Diagnosticated in the manner outlined above there will be a small, but important, group in which there has been a small-cell infiltration of the labyrinth as the result of syphilis, acquired or inherited; of cerebro-spinal meningitis, or typhoid, or other fevers. The onset of the deafness may be sudden, usually without vertigo, or it may be stealthy and gradual. Acoustic hyperæsthesia may precede it, and the condition may be very unequal on the two sides. In children, who are its more frequent victims, it is generally only noted that they do not hear or that they are not talking as they should. Convulsions without defined or protracted illness may be reported as the starting-point, or trauma with loss of consciousness. The deafness following mumps may belong in this category, but generally seems rather an acoustic paralysis.

Autopsies in cases of cerebro-spinal fever where there had developed deafness *intra vitam*, which revealed destructive tissue-changes in the internal ear. The processes were suppuration and necrosis. The probable cause is a direct action of the morbid virus upon the capillaries of the periosteum,—and pre-eminently in the semicircular canals,—producing vascular stasis and thrombosis in this membrane, with consequent necrosis of the structures thereto attached. Steinbrugge (Archives of Otolgy, vol. xvii, p. 51, '88).

Two cases of total loss of hearing in both ears consequent upon mumps. One patient had suffered from purulent otitis; the other case presented normal membranæ tympani. In such cases the lesion is located within the labyrinth. Barr (Glasgow Med. Jour., June, '89).

As a result of scarlatina, three different conditions of the aural mucous membrane are noted: 1. Great swelling, with serous infiltrations of the connective-tissue stroma. In such conditions the exudate is purulent and tends to perforation of the drum-head. 2. Necrosis of swelled mucous membrane; so that, in many cases, the ossicles are denuded of periosteum. 3. Acute carious process upon the wall of the labyrinth and the ossicles. This condition soon leads to inflammation of the membranous labyrinth. L. Katz (Deutsche med.-Zeit., July 8, '90).

Deafness, tinnitus, and vertigo may be caused by either congestion or anæmia of the labyrinth. The inhalation of a few drops of nitrite of amyl will temporarily relieve these symptoms if they be due to ischæmia, but will increase them if they be due to congestion. This differentiation of etiology will enable the physician to properly treat the disease. Lermoyez (Ann. des Mal. de l'Oreille, July 8, '96).

Apoplectiform affections of the labyrinth in two men employed in submerged caissons. When the Eustachian tube is permeable the ear endures the increased atmospheric pressure in submarine caissons; when it is not permeable, the inward pressure of the membrana produces congestion of the drum-cavity and finally

of the internal ear. F. Alt (Aust. Otol. Soc., June, '96; Ann. des Mal. de l'Oreille, Jan., '97).

Syphilis.

The stigmata of inherited syphilis are to be sought in the typical facies; with it exaggerated naso-labial lines, the high-vaulted palate, wide-spaced and pegged incisor teeth, only sometimes notched, the clouded corneæ or nodes upon the shin or other bones. The family-history, with miscarriages and early deaths or typical lesions in other members, may be our only evidence.

Absolute deafness cannot be merely tympanic; in such cases we can conceive of no obstruction which could totally prevent conduction to a sensitive labyrinth, and must assume impairment of this or the centres beyond. In some instances where the response to tests is uncertain or contradictory, the presence of Hutchinson teeth, interstitial keratitis, or other evidences of congenital syphilis may serve to warn us of the probability of deeper trouble, even if the abnormality of the drum-heads may seem to account for the deafness as tympanic.

In any case where the patient seems worse for inflation, it will be well to review the tests for suspected affection of the internal ear; and unless explanation can be found in an overdistended drum-head or unintentionally vigorous use of the air-douche, even negative findings must put us on our guard. B. A. Randall (Phila. Polyclinic, Feb. 8, '96).

Form of acute syphilitic affection of the ear, probably due to an effusion into the labyrinth in a previously normal ear, is characterized by sudden deafness, tinnitus, and vertigo, coming on in the late secondary or early tertiary stage of systemic syphilis. The difference between this form of sudden deafness, tinnitus, and vertigo, and that due to non-syphilitic causes is that the deafness is not so profound in the specific form. The syphilitic aural affection yields promptly to a few doses given hypodermically of pilocarpine ($\frac{1}{10}$ grain), whereas non-syphilitic labyrinth diseases are entirely unaffected by pilocarpine.

E. A. Crockett (Boston Med. and Surg. Jour., Feb. 11, '97).

Treatment.—Whether syphilitic or not, the same treatment is indicated. Absorption of the infiltration by mercurials and iodides constitutes our main resort. In recent specific cases Politzer's vigorous use of pilocarpine has given excellent results in some cases; but the treatment cannot always be borne, is inconvenient with its sweatings, and can hardly equal for the ear or for the general condition the usual antisymphilitic medication. Long-standing cases offer little prospect of benefit, but they have been known to gain beyond all expectation; and the underlying disease may in itself demand treatment.

Nitroglycerin exerts but little influence in disease of the labyrinth in hereditary syphilis (where the iodide of potassium yields better results). It is of the greatest utility in the removal of hæmorrhagic extravasation or recently-organized lymph, especially in acute processes in the labyrinth. Politzer (Wiener med. Blatter, No. 4, '88).

Subcutaneous injections of pilocarpine, beginning with 2 drops of a 2-per-cent. solution and increasing to 8 drops, are of great service in all recent affections of the labyrinth. From 10 to 15 injections ought to produce the result aimed at; if not, the remedy is to be abandoned. Politzer (Lancet, Jan. 2, '91).

In a case of anæmia of the labyrinth trinitrin in doses of $\frac{1}{100}$ grain three times daily permanently relieves the deafness, tinnitus, and vertigo. In cases of congestion of the labyrinth an alterative or absorbent treatment is indicated. Lermoyez (Annales des. Mal. de l'Oreille, July, '96).

Pilocarpine gives the best results in syphilitic diseases of the internal ear. Thomas J. Harris (Manhattan Eye and Ear Hosp. Rep., Jan., '97).

Labyrinthine Effusion (Meniere's Disease).

Another notable group includes the cases of labyrinthine effusion causing

vertigo and deafness, generally associated with Ménière's name. "The Ménière complex of symptoms" is now generally spoken of, and some writers have not only differentiated tympanic vertigoes, but have inclined to deny the reality of "Ménière's disease." Yet, clear-cut cases of this affection do undoubtedly occur, and the influenza epidemics caused not a few of them. The seizure is usually apoplectiform, with intense vertigo, not infrequently severe nausea and marked deafness. Some cases note the dizziness only on rising, but others are almost as distressed by it while at absolute rest in bed. Whether the acoustic or the co-ordination areas of the labyrinth are the seat of the lesion, both functions are at first profoundly affected; but the mere serous effusions can probably absorb completely, leaving no loss of hearing. As the labyrinth vertigo is usually an *irritative* lesion, disappearing equally whether resolution or destruction be the result, it is possible that all of the profound affections are exudative or hæmorrhagic, but that we have no means of recognizing the destruction left in the semicircular canals, if the limited lesion is here. Some cases of typical labyrinthine apoplexy recover almost completely, but with a permanent gap at some part of the auditory scale.

In gouty cases a train of symptoms suddenly arises, resulting from serous effusion into the labyrinth, and giving most of the characteristics of Ménière's disease,—tinnitus and deafness, especially for tones of high pitch, being intense. The musical sense is lost. The attack disappears, but recurs with ever-shortening intervals of health, and produces progressive impairment of hearing. A point of differential diagnosis between this condition and a simple catarrhal process is that, in the latter, there exists an inequality in hearing between the two ears. In labyrinth effusion, the conducting apparatus being unaffected, the note

will be heard as one clear sound. Alex. Ogston (Med. Press and Circular, June 11, '90).

In two cases the patients presented all the phases of Ménière's disease, while the parents and other members of the family suffered either from similar symptoms or from nervous manifestations. Simon (Johns Hopkins Hosp. Bull., Sept., '93).

Ménière's disease is relatively frequent in cases of *ozæna*, while middle-ear catarrh with nasal disease has occurred in many cases. Among constitutional dyscrasias syphilis is a frequent exciting cause of labyrinthine hæmorrhage, while many cases may be traced to Bright's disease, atheromatous arteries, exertion, trauma, mumps, etc. Thomas Barr (Brit. Med. Jour., Dec. 28, '95).

The deafness resulting from an intense extravasation within the labyrinth, such as occurs in Ménière's disease, never disappears and is usually bilateral. T. A. Kenefic (Med. Record, July 25, '96).

The main cause of chronic ear-vertigo (Ménière's disease) is impaction of the stapes in the oval window, and removal of this retractive force and liberation of the stapes will cure this. Removal of the incus to break the retractive force of the tensor tympani and malleus exerted through the incus upon the stapes. In chronic purulent cases excision of the remnants of the diseased membrana tympani and the malleus and the incus, with their synechial bands, to liberate the stapes. This, with treatment of the purulent drum-cavity, is followed by cessation of the vertiginous attacks and cure of the chronic purulency. H. Burnett (Phila. Med. Jour., Sept. 22, 1900).

Treatment.—Total rest, derivatives, and perhaps blood-letting should be first tried, followed by absorbent alteratives. Charcot's use of heroic doses of quinine should be a last resort, as a means to complete the destruction of tissues incapable of resolution.

In treatment of Ménière's disease reliance placed upon quinine, especially in the chronic forms, and combined, usually, with ergotine in equal dose, namely: from 9 to 15½ grains daily. In the

apoplectic type of the disease quinine is superfluous, but iodide of potassium is of great use. Tsakyroglous (*Monatshfte f. Ohrenh.*, Nov., '92).

Three cases of Ménière's disease cured by the administration daily of three powders containing each 46 grains of bromide of potassium, and three pills,—valerianate of iron, 15 $\frac{1}{2}$ grains; opium, 4 g.ains; extract and powder of cascara sagrada, q. s. ad pil. xij. The cure was permanent. Roméo Mongardi (*Annales des Mal. de l'Oreille*, etc., Dec., '92).

In the apoplectic form, rest in bed, counter-irritation by means of blisters, and large doses of the bromides are indicated. In some cases pilocarpine may be tried to restore the hearing. However, in most cases of this form, the treatment is unavailing. The epileptic form offers much better chances of improvement under the administration of bromides in large doses, or, still better, hydrobromic acid in doses of 48 to 60 minims. In a few cases sodium salicylate is productive of good results. Large doses of quinine have not given good results in personal hands, but quinine in small doses, combined with iron and strychnine, is an efficient tonic. Concomitant otitis calls for its own treatment. Occasionally a blister will improve the hearing and diminish the tinnitus aurium. The use of pilocarpine is seldom advisable. Pritchard (*Merck's Archives*, May, 1901).

The effect of quinine, salicylic acid, and other drugs upon the labyrinth is often misunderstood. They certainly cause hyperæmia in physiological dose; but probably here, as elsewhere, in toxic doses produce profound ischæmia, such as is seen in the eye in quinine-blindness. Diseased ears are apt to be especially susceptible to the tinnitus and other discomforts of these drugs; but it is an open question whether they are more prone to be injured by them than normal. Malarial affections may leave marked or total deafness when no quinine has been given; and many a case has unjustly drawn blame upon the phy-

sician because he has given quinine when his only error, if any, has been in giving too little. Just as in the tympanic inflammations, stasis must be overcome at times, and quinine is often our best, if not the most comfortable, means to this end. As the prejudice against it is widespread, however, great caution must be employed in its use; even those with anæmic tinnitus, who find prompt relief from its exhibition, showing sometimes the greatest reluctance to take it.

Akin, perhaps, to these cases are the losses of hearing following mumps, diphtheria, and other acute affections. They can, perhaps, be best compared to the blindness following ptomaine-poisoning from sausage and such foods. There is certainly microbic invasion of the labyrinth in some of the diphtheritic cases; but these are apt to show the more usual septic inflammatory reactions. Acoustic atrophy, like that of the optic nerve, generally calls for an alterative course to limit and repair, if possible, the ulterior lesion, followed by vigorous strychnine stimulation.

Occupation-deafness.

Finally, the matter of "occupation-deafness" demands our consideration, since it offers a valuable field for prophylaxis. "Boilermakers' deafness" is met among workmen in many trades where noise is great and continuous; but the riveter inside a boiler is naturally the most prone to suffer with the effects of such concussion upon his acoustic apparatus. Tampons have been employed with slight palliative effect; but the sufferer had best change his work to a safer one. Tympanic affection may be coincidently active and demand appropriate treatment, but should not blind us to the deeper condition. The rapid-fire automatic gun is likely to claim many victims in this way, just as the dentist's

electric hammer paralyzed the nerve-supply of many teeth before its dangers were recognized. So, too, the various methods of persistent pneumatic or phono-massage have wrought much damage already and are likely to find countless victims yet, who are misled by a brief stimulation of the torpid nervous apparatus and press on with the measure until all acoustic reaction is exhausted.

The effect of artillery practice on the ears. Of the 96 ears examined, only 34 could be considered as normal *before* the firing; the remainder showed alterations in the position and coloring of the tympanic membrane, such as retraction, dullness, opacities, chalky deposits, and a slight vascular injection; in no case was there any perforation. *After* the firing, the appearances were the same as before in 52 ears; the remaining 44 showed distinct vascular congestion in spite of the cotton-wool, which German artillery soldiers are required to use in their ears. The intensity of the congestion varied, being extreme in one-third of the cases, but in no instance was the whole membrane red, there being even in the most marked cases still some normal color visible. Extravasations of blood were seen in 7 men, and always in the ears which showed the greatest hyperæmia; these extravasations were multiple and very small in size. In no case was the tympanic membrane ruptured. Further interest in these observations lies in this fact that the ears found normal before the firing were always normal afterward; indeed, there were only three exceptions to this rule, a slight injection being noted in these cases. The alterations produced by the firing occurred therefore in the ears that were already abnormal, 41 out of 62 being found to have increased abnormalities as the result of the concussions. Müller (Arch. of Otol., Aug., '99).

Tinnitus.

Tinnitus is a symptom rather than an affection, as to which much remains to be learned. Where it is high pitched and of long standing little expectation

of its disappearance should be raised; but it ought to be generally possible to reduce it to a mild annoyance. It is at times strictly cerebral; may be due to turbinal pressure in the nose; but is generally of tympanic origin and can be benefited by treatment of the coincident deafness. Yet it may have no relation to the defect of hearing, occurring when it is unthreatened or persisting after it has been restored. General vascular conditions must be looked to in the blowing type of noises, and dietetic rather than medicinal measures resorted to. Pneumatic massage, most easily employed with the finger-tip, will often do much for its relief.

Use of Delstanche's rarefacteur advised in labyrinthine disturbance due to sudden loud noises or explosions for the purpose of restoring to a normal position the indriven tympanic structures and stapes. Pilocarpine is not contra-indicated in inflammation of the auditory nerve due to meningitis, but, on the contrary, is to be recommended in recent cases in view of the fact that the labyrinth is usually implicated. In the use of the galvanic current in cases of nervous tinnitus the positive pole should be applied to the tragus. When one ear only is being galvanized the current should not exceed from 2 to 4 milliamperes, and it is only when the current is divided between the two ears, both being treated at the same time, that it is at all advisable to double the strength of the current. Dundas Grant (Lancet, Aug. 24, Sept. 14, '95).

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INTERTRIGO.

Definition.—Intertrigo is an hyperæmic affection of the skin characterized by an erythematous condition produced upon contiguous surfaces, accompanied with an exudation of sweat with maceration of the skin.

Symptoms.—Intertrigo is produced through closeness of contact between two opposing surfaces. The juxtaposition may cause irritation whether assisted or not by friction. It is an affection of hot weather, but may also occur in the winter. Heat acting directly on the subject and thus indirectly upon contiguous areas assists in its production and extension. It occurs in regions such as the nates, groins, axillæ, the spaces between and beneath the breasts in the female or in corpulent males, as well as overlapping portions of the abdomen, the sulci of the fingers and toes and, in fact, any redundant portion of skin.

At first there is only an erythematous blush, but this soon increases in degree and in extent. Prolonged contiguity may lead to a true traumatic erythema, which with the retained sweat causes maceration of the adjacent portions of skin. If allowed to continue, the maceration may extend and end in a true inflammatory process. In infants intertrigo is apt to be an annoying affection, especially when it occurs through inattention of the parts after micturition and defecation. Eczema is likely to supervene if no attention be given. The rubbing is also encountered after horseback-riding, rubbing of tight-fitting boots or clothes, etc. (erythema paratrimma).

The parts are hot and tender, if not actually painful, and movement causes a scraping sensation. In an unattended case bleeding may occur as a result of fissures and removal of the upper layers of the epidermis. The parts emit a disagreeable odor, and according to Crocker, of London, stain—but do not stiffen—linen: a point which this author adduces as of diagnostic value between eczema and intertrigo.

Diagnosis.—The diagnosis of this condition is not difficult. The fact that

there are two opposing surfaces in which there is a retention of sweat, emitting a disagreeable odor, and causing maceration and fissuring of these surfaces, should be sufficient in most cases. Removal of the cause is generally followed by an early cessation of the symptoms. Eczema will persist for shorter or longer periods, according to the extent of surface involved, and not alone will remain in position, but will also increase, if not judiciously treated. In the latter affection there is some degree of infiltration and thickening, which does not occur in erythema intertrigo unless eczema complicates the process. Congenital syphilis may also be confounded with this affection, but the fact that syphilis extends far beyond the borders of the contiguous surfaces will generally suffice to prevent error. Syphilis also produces a darker discoloration. An "*erythème syphilitiforme*" is noted by A. Fournier, which begins as a papulo-vesicle and resembles the vaccine-papule; but, as these lesions are to be found in repeated succession, error is hardly possible.

Etiology.—The causes of intertrigo are manifold. Warm weather or heat produced by artificial means during the winter season may act as an inducing factor. Exaggerated exercise, rowing, running, horseback-riding, as well as sedentary habits as observed in clerks who sit for long periods on leather-cushioned stools, or persons who wear unsuitable undergarments, and sweating at contiguous points are known causes. Friction, with or without moisture, will induce it. Secretions—such as saliva (the cases, for instance, following repeated protrusion of the tongue and licking the parts), vaginal discharges, unremoved fæces during the existence of a diarrhœa, the dribbling of urine and the complication of glycosuria—are as many

etiological factors. Many other conditions contribute to assist in its production and extension, such as the milk upon the garments of careless mothers, which, thus being allowed to dry, roughens and stiffens the dressings; so that rubbing is soon induced. In young infants improperly-washed diapers are also causative media.

Through want of cleanliness and profuse sweating, the epidermal surface becomes rough or excoriated, redness and hyperæmia occur, and a suitable soil for micro-organisms is afforded. A causative germ, the micrococcus intertriginis, penetrates into the deeper layers of the skin, exciting an irritating, cheesy material, which may cause suppuration and ulceration. Cultivations from the cheesy spots produced colonies of spherical micro-organisms, light yellow in color, with finely-serrated margins. The gelatin was liquefied, forming first a shallow depression, which gradually grew funnel-shaped, leaving in its concavity the liquefied gelatin, which, mingled with the colonies, now gave off a disagreeable odor like that of rotten cheese. Stab cultures grew similarly, but sent out threads penetrating the medium in all directions. On agar the cultures only grew on the surface in colonies of a light-yellow color. In serum the growth was rapid and formed a light-yellow membrane. On potatoes a yellowish-brown spot appeared, from which the colonies spread, the margins being of a lighter color than the centre. Milk was not coagulated or acidified, and the indol reaction was not observed. The organism was a micrococcus of from 0.5 to 0.9 micromillimetre in diameter, without flagella or spores. It is aerobic, and in the hanging drop it does not reveal any independent movement. It stains well with the aqueous aniline dyes, and decolorizes with Gram's method. The disease could be reproduced in animals in forty-eight hours, and cultures from the seat of inoculation reproduced the same germs. These were found to be virulent even down to the tenth generation. They grew best at the body-temperature, and at temperatures

above 70° C. and below 10° C. they were destroyed. A 1/2-per-cent. solution of formaldehyde was found most efficacious in killing them. Max Meyer (N. Y. Med. Jour., Dec. 16, '99).

Treatment.—As a rule, little or no treatment is required. Removal of the cause will usually end in early recovery. Inattention to the parts may allow the case to proceed to a high grade of inflammation. The first indication is to remove, by means of some bland soap—Castile or glycerin soap—and water, the foreign elements acting as irritating factors, and immediately afterward dry with a soft towel. An odor may require the addition of a slight quantity of carbolic acid or thymol. Bland dusting-powders are very useful; but if allowed to remain and absorb the discharges they induce an aggravation. Boric acid, talc, fulfers' earth, lycopodium, or starch in impalpable powder relieves both pain and irritation. Solutions are often more grateful, but must be applied almost continuously to obtain good effects. Boric acid in saturated solution is one of the best agents. Sulphite and hyposulphite of sodium in water in the strength of from 1/2 to 1 drachm to the ounce are often beneficial. Astringent washes give excellent results. Acetate of lead (3 to 5 grains to the ounce of water), sulphate of zinc (1 or more grains to ounce of water), acetate of zinc (in similar proportions), bichloride of mercury (1 to 2 grains to 1000 parts of water), calomel (3 to 5 grains to the ounce of lime-water—*lotio nigra*) are all efficacious. A useful method is to apply one of the above lotions for a period of fifteen minutes, then to thoroughly dry the parts by mopping them; and to follow this by one of the dusting-powders. This should be carried out three or more times during each half of the twenty-four hours. In addition to the remedial measures the

parts must be kept apart by means of medicated lint or cotton: a procedure which suffices in some of the cases observed. In obstinate cases it may be advisable to place the patient in bed to keep the limbs apart until the acute phase of the trouble disappears.

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INTESTINAL OBSTRUCTION AND ANASTOMOSIS. See OBSTRUCTION, INTESTINAL.

INTESTINAL PARASITES. See PARASITES.

INTESTINES.

Duodenum, Inflammation of.

Synonyms. — Duodenitis; duodenal catarrh.

Symptoms.—While the possibility of isolated inflammation of the duodenum cannot be denied, it is probable that the condition is usually associated with inflammation of the stomach, on the one hand, and of the remainder of the small intestine, on the other hand. Among the symptoms are pain, distress or discomfort in the right upper quadrant of the abdomen, impaired appetite, bad taste, coated tongue, discomfort from two to four hours after taking food, with eructations and flatulent distension. There is likely to be nausea and at times there is vomiting, with bilious fluid in the ejecta. As a rule, the bowels are constipated, though there may be diarrhoea. Often, also, there is jaundice, from extension of the catarrhal process to the choledoch-duct and resulting obstruction to the flow of bile, with clay-colored stools, etc. There may be, further, weakening and despondency, and possibly slight elevation of temperature. Acute or subacute attacks may last two or three weeks, chronic attacks for as many months.

The condition is not a serious one, and recovery is usually prompt upon institution of the proper therapeutic measures.

Etiology.—The causative influences include, in a general way, irritants generated within the body, as from fermentation or autointoxication; or introduced from without, as milk, food, or by accident, or possibly by design.

Treatment.—The treatment consists primarily in a regulation of the diet, with rigid restriction as to both quantity and quality of food, and perhaps temporary abstinence, and recumbency in bed, when the symptoms are acute. From 6 to 8 ounces of milk, peptonized or pancreatized if not well digested without preparation, may be given every three hours. Unirritating broths and soups, strained gruels, farinaceous foods, boiled rice and soft-boiled eggs, albumin-water, and barley-water may also be permitted. Solid food, and especially the coarser vegetables and fruits, which leave considerable residue, are particularly to be avoided. Small doses of calomel, $\frac{1}{4}$ grain, may be given at hourly intervals for a short time, followed by a saline, such as the compound effervescent (Seidlitz) powder, sodium phosphate, sodium-potassium tartrate; or the saline may have been given alone at the outset. Counter-irritation, as with a mustard-plaster, in the right hypochondrium, may relieve pain and allay nausea and vomiting. If diarrhoea be present the salts of bismuth will be indicated, of the subcarbonate and subnitrate, from 10 to 20 grains; or the salicylate or subgallate from 5 to 10 grains.

Duodenum, Ulceration of.

Symptoms.—The clinical manifestations of ulcer of the duodenum are variable and but little characteristic. The condition may, in fact, give rise to no symptoms and be discovered only upon

post-mortem examination or through the occurrence of hæmorrhage, perforation, suppuration, peritonitis, stenosis of the bowel, dilatation of the stomach, or jaundice.

In duodenal ulcer there are usually three main symptoms: the intestinal hæmorrhage, pain, and digestive disorder. The hæmorrhage occurs in three varieties: A fulminating or fatal form; an acute form, in which the hæmorrhage keeps on recurring and exhausts the patient; and a chronic form, in which the hæmorrhage is more or less continuous, and in which it may not be noticed. Pain is irregular both in situation and intensity; it usually appears two or three hours after a meal, and is situated within a space bounded by a line from the umbilicus to the margin of the false ribs and along the internal border of the rectus muscle and below the anterior border of the liver. Disorders of digestion are also variable. Dyspeptic troubles are less marked than in gastric ulcer. Ladevèze (*Jour. de Méd. et de Chir. Prat.*, Mar. 25, 1901).

Such symptoms as are present resemble closely those of ulcer of the stomach. The most pronounced and the most distinctive of these is pain in the right hypochondrium, which is usually less acute than that of gastric ulceration, and is likely to appear later after the taking of food, viz.: two or three hours or more.

Duodenal ulcers are not very uncommon. As far as the writer has seen them, they are single and more frequent in men than in women. Perforation may take place and acute symptoms appear, or they may heal, and by cicatrization lead to symptoms of chronic duodenal obstruction. The sequelæ of a healed ulcer may be so remote that the symptoms are mistaken for those due to cancer of the pylorus, and the patient is allowed to drift from bad to worse under the erroneous notion that he is bound to die. There is no means of recognizing the existence of a duodenal ulcer, in a great many cases, until it

perforates or until the results of its cicatrization becomes manifest.

The treatment of duodenal ulceration consists in the direct suture of a perforated ulcer, the prognosis being less favorable than in similar cases of perforation, and the performance of gastro-jejunostomy in cases of dilated stomach due to duodenal constriction, the prognosis being the most favorable of all the conditions for which this operation is performed at the present time. D'Arcy Power (*Brit. Med. Jour.*, December 17, 1904).

The pain is at times spontaneous, and it can usually be induced or intensified by pressure. At times it recurs in severe paroxysms, radiating to the epigastrium and the sacrum. At other times there is only a sense of vague discomfort or of pressure or of tension. Occasionally there is a feeling of hunger, of gnawing, of corrosion, or of the presence of a foreign body. Rarely a tumor can be felt. The appetite may be unaffected and the bowels regular. Dyspeptic symptoms, if present at all, are not pronounced. Exceptionally there is diarrhœa, but more commonly there is constipation. Vomiting is not usual, but when it does occur, it takes place usually after a paroxysm of pain or in consequence of a complicating gastric disorder or perhaps of cicatricial stricture of the duodenum close to the pylorus. Unless the vomitus contain blood it is not distinctive. Hæmorrhage is one of the more common symptoms, and it may be slight or copious. The blood may be vomited, or it may be passed by the bowel, or it may be expelled in both these ways. The loss of blood may be sufficient to cause death without the escape of blood externally. Jaundice occurs rarely and may then be attributed to cicatricial constriction of the chole-doch-duct. The disorder may be of long duration and recurrence is not rare after

recovery has taken place. Death may result suddenly from perforation or hæmorrhage.

Collin's investigations have shown that, in 262 cases collected, the distance between the ulcer and the pylorus was less than 2 inches in 242 cases: *i.e.*, in the upper third of the duodenum. In 85.6 per cent. there was a single ulcer; in 26 cases two ulcers; in 3 cases three ulcers; in 4 cases five ulcers. The usual site is on the anterior duodenal wall. Duodenal ulcers are far more likely to perforate than ulcers of the stomach. Sixty-nine per cent. perforate. In the majority of cases perforation took place directly into the peritoneal cavity.

Intense pain is a constant symptom, and is located in half the cases below the right costal arch or in the epigastrium; rarely on the left side. Prostration is rapid. Temperature is rarely above 100° F., but the pulse is markedly accelerated. Vomiting may not appear for forty-eight hours. There is rapidly increasing rigidity of the abdominal muscles. Percussion gives tympany in place of normal liver-dullness. Schwartz (Brooklyn Med. Jour., July, '99).

Diagnosis.—The diagnosis may be attended with much difficulty; in fact, the condition may escape detection. The pain and tenderness of duodenal ulceration are situated rather more to the right than that of gastric ulceration, while the pain induced by the taking of food occurs, as a rule, later with the former than with the latter; and when hæmorrhage occurs the blood is more likely to be passed by the bowel than to be vomited. From malignant disease ulceration of the duodenum is to be differentiated usually by the absence of a tumor and of cachexia and by the greater likelihood of hæmorrhage, by the acidity of the gastric juice, with the presence of free hydrochloric acid. The paroxysms of pain may simulate biliary colic, but with the latter jaundice is more common, the symptoms of digestive derangement are less pro-

nounced, the symptoms in general, or their aggravation, are less related to the taking of food, and there is an absence of emesis and of hæmorrhage from the bowel.

Etiology and Pathology.—Ulceration of the duodenum is analogous to the same lesion as it occurs in the stomach, and it has much the same etiology, pathology, morbid anatomy, and treatment. The process is, however, much less common in the duodenum than in the stomach, in a proportion, as given by various authorities, varying from 1-9 to 1-40. Sometimes ulceration is present in both stomach and duodenum in the same case. The condition is due, in the majority of cases, to the action of the gastric juice upon portions of the mucous membrane whose vitality is lowered by any one of a number of conditions, *viz.*: venous stasis, hæmorrhage, ischæmia (thrombosis, embolism, vascular spasm, arteriosclerosis), hyaline degeneration of the walls of the arteries, traumatism, etc. The affection is observed most commonly between the ages of 20 and 60, the prevalence being fairly equal in several decades. Occasionally it is encountered in infants. Males suffer in larger number than females, the proportion being given as 3 to 1.

In investigating the records of 17,652 post-mortem examinations at Guy's Hospital the authors found 70 cases in which there was an ulcer of the duodenum, either open or healed. It is much rarer than gastric ulcer.

The author's cases give a proportion of 52 males to 17 females, or, if burns be excluded, 48 males to 16 females,—a ratio of 3 to 1. The total of the collected cases gives 109 males to 48 females, or, excluding burns, of 100 males to 30 females. Thus, while duodenal ulcer is three times as common in males as in females, gastric ulcer is twice as common in females as in males. Perry and Shaw (Guy's Hosp. Reports, vol. 1, p. 171).

Ulceration of the duodenum must be included among the complications of chronic kidney disease, especially of interstitial nephritis in its later stages of uræmia. Its frequency is greater than has formerly been supposed. It is probably not specially sought for post-mortem. It is met with in three forms (which are the successive stages of the same process)—(a) simple hæmorrhagic infiltration of the mucosa; (b) follicular or linear erosions of the mucosa; (c) true perforating ulcers. All three forms are usually met with in the first part of the duodenum, especially on its posterior wall, and in the authors' cases no tendency towards healing was found. The ulceration seems to be dependent upon a variety of causes, the chief excitants being the accumulation within the organism of toxic products, and co-incident infectious diseases; among the predisposing causes are diseases of the general circulatory system, local endarteritis of the small arterioles of the duodenal wall and trophic changes from the effects of toxæmia on the nervous system. Mention is made here of the coincidence in a fourth of the authors' cases of scoliosis. Usually the ulcer gives rise to no symptoms, its essential characters being, in addition to absence of repair, its rapid and deep extension with the consequent frequent hæmorrhage and perforation. E. Devic and J. Charvet (*Rev. de Med.*, Vol. xxiii, p. 881, 1903).

The lesion is commonly situated close to the pylorus. Usually there is but a single ulcer; occasionally there are more. The ulcer varies in size and depth.

The simple ulcer of the duodenum is usually round. Sometimes, however, it is oval, angular, or even irregular. In size it is most variable. Generally, the ulcer is more or less perpendicular to the walls of the intestine. When the ulcer is very chronic, the cicatricial contraction occasions considerable deformity of the adjacent parts. Extension to the neighboring arteries appears to occur in the following order of frequency: the pancreatico-duodenal, the right gastro-

epiploic, the hepatic, and then the pancreatic artery. Perforation is the complication most to be dreaded. In 262 cases perforation occurred 181 times. Collin (*Thèse de Paris*, '94).

In the process of cicatrization it may cause stenosis of the bowel, or, if situated close to the papillæ of Vater, it may in the same way cause obstruction of the choledoch and pancreatic ducts. The portal vein may suffer obstruction from a like cause, with the development of thrombosis and the attendant train of symptoms. The ulcer may perforate into the peritoneal cavity and thus cause death from shock or diffuse peritonitis; or by erosion of a blood-vessel it may give rise to copious hæmorrhage. Perforation may also take place into an adjacent viscus, or through the abdominal wall, giving rise to the development of subcutaneous emphysema or the formation of a duodenal fistula. Often there is circumscribed peritonitis about the site of the ulcer, with adhesions to contiguous organs. Carcinoma develops at times in the seat of previous ulceration of the duodenum.

Burns of the surface are sometimes attended with ulceration of the gastrointestinal tract, most commonly in the duodenum, but occasionally in other portions. (See BURNS, volume i.)

The usual seat in the duodenum is the superior horizontal portion not far from the pylorus. There may be a single ulcer or several. The lesion may assume all grades of severity, from a simple erosion to deep loss of substance. There may be, besides, diffuse inflammation of the mucous membrane. The process is a rapid one and it may quickly cause death; although, on the other hand, the symptoms may be deferred for some time.

Ulceration of the duodenum may occur also from other causes, such as embolism, thrombosis, as in the course of

endocarditis, atheroma, pulmonary abscess, amyloid disease, catarrhal or follicular disease, or tuberculosis.

Prognosis.—The prognosis, while perhaps a little uncertain, is, on the whole, favorable, providing the disease is recognized and intelligently treated. There is, of course, the danger of fatal hæmorrhage as well as of perforation and peritonitis, while recurrence is not rare, and carcinoma may develop at the site of previous ulceration. The affection is sometimes exceedingly unyielding to treatment, and its duration may be protracted.

Within the past eight years the mortality (when operation has been performed within twelve hours) has fallen from 39 to 17 per cent. in the treatment of gastric ulcer, and a similar improvement will take place in the recognition and proper treatment of duodenal ulcers. Operation is seldom called for before perforation has occurred. R. F. Weir (*Med. Record*, May 5, 1900).

Treatment.—The treatment does not differ essentially from that laid down for gastric ulcer, and includes rest in bed; a bland, unirritating, nutritious diet, including especially predigested milk; and the administration of alkalies, preparations of bismuth, and iron. Hæmorrhage will demand absolute rest, abstinence from food by the mouth, and the administration of opium and perhaps also of ergot. The local application of an ice-bag may prove serviceable. A single copious hæmorrhage or repeated free bleeding may justify surgical intervention and cauterization or ligature of the bleeding point. There is justification, further, for excision of the ulcer to remove the possibility of the subsequent development of carcinoma.

Case of perforated duodenal ulcer cured by operation. A. Landerer and Gluecksmann (*Mit. aus den Grenzgebieten der Med. u. Chir.*, B. 1, H. 2).

In duodenal ulcer absolutely nothing should be given by the mouth for about a fortnight. As a nutrient enema, beef-broth, 140 grammes; 6 eggs; wine, 20 grammes; sodium chloride, 2 small teaspoonfuls, beaten up for some time and injected lukewarm is excellent. The amount ought not to exceed 250 cubic centimetres. The nutrient ought to be varied with ordinary evacuants. After a fortnight's time a gradual return to ordinary alimentation is recommended. Surgical intervention has been followed by good results. Ladevèze (*Jour. de Méd. et de Chir. Prat.*, Mar. 25, 1901).

The medical treatment of duodenal ulcer should be carried out with the same persistence and care as are needed in treating ulcers of the stomach. Surgical treatment may be called for: (1) when an acute ulcer perforates, (2) when subacute or chronic perforation leads to periduodenal or subphrenic abscesses, (3) in chronic ulcer when pain and gastrorrhagia or enterorrhagia are persistent and disabling, and (4) when cicatricial contraction and induration or periduodenitis have caused narrowing of the calibre of the gut and dilatation of the stomach or of the stomach and that part of the duodenum behind the stricture. B. G. A. Moynihan (*Lancet*, Dec. 14, 1901).

Cæcum, Diseases of.

Synonyms.—Typhlitis; cæctitis; inflammation of the cæcum; paratyphlitis; perityphlitis.

Symptoms.—The most distinctive symptom of typhlitis is pain or a sense of discomfort in the right iliac region. With this there is, as a rule, associated constipation, although there may be diarrhoea. The appetite is likely to be impaired, the tongue to be coated, the breath to be offensive, a bad taste to be present, and there may be tympanites, as well as nausea and vomiting. The temperature is but little affected and the constitutional disturbance is inconsiderable. The presence of fæcal masses in the bowel may give rise to a palpable

tumor, yielding dullness on percussion. Extension of the disease-process to the appendix will induce additional symptoms elsewhere described as characteristic of this condition. Inflammation of the connective tissue or of the peritoneum surrounding the cæcum will be attended, in addition to febrile manifestations and a general aggravation of existing symptoms, with a sense of doughy induration on palpation, on the one hand, perhaps progressing to suppuration, with the possibility of rupture into the peritoneal cavity; and, on the other, with the development of signs of peritonitis, which may remain localized or become diffuse.

Diagnosis.—The diagnosis of typhlitis is to be made from the mildness of the symptoms, and the readiness with which they yield to appropriate treatment, and the absence of evidences of constitutional disturbance. As has already been intimated, the differentiation from appendicitis is exceedingly difficult and oftentimes impossible, by reason of anatomical peculiarities. Appendicitis, comparatively, may be looked upon as the graver of the two conditions, and its symptoms may be considered the more marked and the less yielding to treatment. Under favorable conditions it may be possible to distinguish by palpation between an inflamed cæcum and an inflamed appendix. It is doubtful if paratyphlitis and perityphlitis are to be differentiated from para-appendicitis and periappendicitis. (See APPENDICITIS, volume i.)

Etiology.—Isolated inflammation of the cæcum is probably an uncommon condition, if it occur at all. On the other hand, typhlitis will be found, as a rule, to accompany enteritis and colitis, and also appendicitis, with the symptoms

of each of which its own symptoms are likely to be blended.

Cause of all typhlitis and perityphlitis and paratyphlitis assigned to an inflammatory process in the appendix, due to its occlusion either by fæces, fæcal calculi, stricture, or, more seldom, foreign bodies. Schede (Deut. med. Woch., June 8, '92).

Perityphlitis is unusually common in America, due to two of our natural failings: eating too much and chewing too little, the result of which is constipation.

Lange (N. Y. Med. Jour., June 6, '91).

The cæcum may, with the adjacent bowel, be the seat also of tuberculous, syphilitic, typhoid, or dysenteric infiltration, and perhaps secondary ulceration. The symptomatology attributed in the past to syphilis was largely constructed from the manifestations of what we have learned to recognize as appendicitis. At the same time, the possibility of catarrhal inflammation of the cæcum cannot be denied. Such a condition may arise in consequence of the presence of irritants, either introduced from without or generated within the body; but, as has been stated, the responsible agencies do not confine their activities to the head of the colon. The long-continued presence of hardened fæcal masses in the cæcum may cause irritation and give rise to ulceration, with the development of either paratyphlitis, inflammation of the connective tissue surrounding the cæcum; or perityphlitis, inflammation of its peritoneal covering; and these may be responsible in time for more remote complications. This train of events, it may be concluded from the experience of recent years, is like typhlitis itself, rather uncommon, so-called paratyphlitis being in the vast preponderance of cases para-appendicitis and periappendicitis.

Prognosis.—The prognosis of simple catarrhal typhlitis is favorable. Recov-

ery is the rule under judicious treatment, though recurrence may take place on renewal of the provocative conditions. The prognosis is rendered grave by the development of paratyphlitis and graver by that of perityphlitis, both of which may lead to fatal suppurative peritonitis.

Treatment.—The treatment of typhlitis is essentially an eliminative and antiphlogistic one, and will be partly medicinal and partly dietetic. It is best, even in mild cases, for the patient to go to bed, and be placed under conditions of rest and quiet. The diet should be bland and unirritating, and so constituted as to give rise to the least residuum possible. A suitable dietary can be constructed with milk as a basis, and including soft-boiled eggs. Vegetables and solid food in general had better be avoided. If the stomach be irritable, food may be withheld entirely for twenty-four or even forty-eight hours. As constipation is the rule, the bowels are to be moved, and preferably by means of enemata given with the aid of a fountain-syringe. For this purpose, a quart or two quarts of simple warm water may be used; or soap-suds may be added; or 1 or 2 ounces of castor-oil, or olive-oil, or cotton-seed oil, or oil of turpentine, perhaps emulsified with the yolk of an egg. If the constipation prove obstinate, irrigation of the bowel with larger quantities of water may be practiced.

The best treatment of perityphlitis is removal of the intestinal contents in every possible way, especially by washing out the stomach. If the stomach is washed out soon after the onset of fecal stoppage, the fecal masses removed, and this done two or three times daily, the intestines may be relieved, and the decomposition of their contents and absorption of toxic substances prevented. Good effects from this treatment repeatedly observed. Ewald (Berliner klin. Woch., No. 18, '91).

When the constipation has been overcome small doses of calomel, $\frac{1}{8}$ grain hourly for six doses, followed by a saline—magnesium sulphate, sodio-potassium tartrate, sodium phosphate, from 2 to 4 drachms, may be given; or, if the constipation was aggravated originally, the saline may have been given at the outset, preceded or not by 5 grains of calomel. If the bowels be loose and pain be a prominent symptom, opium may be indicated, though deceptive masking of the symptoms by the anodyne is to be guarded against.

The development of paratyphlitis and perityphlitis will demand, in addition to the measures already specified, local applications, preferably of cold, or, if that be badly borne, of heat; and counter-irritation and sorbefacient ointments when the process manifests a tendency to become chronic.

Medical treatment of perityphlitis defended against surgical interference. The plan of treatment is rest, free evacuation of the bowels, hot fomentations, or ice-bags, with the addition, in chronic cases, of repeated blistering over the tumor. Saundby (Birmingham Med. Review, Sept., '91).

In cases of indolence of the cæcum external treatment, friction and massage of the abdomen, with the continuous current, if necessary, are employed, and if there is any congestion of the cæcum or pericæcal ganglia the parts are painted with tincture of iodine or small blisters applied. The diet is of great importance, and no solid foods should be taken, but meats, fish, etc., be reduced to a fine pulp, and vegetables be given in the form of a *purée*. Jules Simon (Revue Gén. de Clin. et de Thér. Jour. des Prat., Jan. 19, '95).

Experiment to ascertain whether or not the external application of the substance, and in particular of the essence of turpentine, might not influence favorably suppurative processes. One investigation in this field, in a case of purulent pleurisy, was crowned with

success, and then on several occasions the author used the essence of turpentine as a resorbent and antiphlogistic. It is, however, in perityphlitis, before the stage of exudation, that the medicine in question appears to give most excellent results. It was used in twelve such cases, either in the form of the essence, or of the essential oil, in a dose of 3 drops, repeated two or four times a day. It may be given in ether or incorporated in the yolk of an egg, or, better, since the stomach does not bear it well, as an emulsion in the yolk of an egg. If there is an exudate around the appendix, it is well to combine internal and external exhibition of turpentine. The internal use of this remedy must be stopped if any trouble appears with the kidneys or lungs. M. Mayer (*Semaine Médicale*, No. 34, 1902).

Suppuration will and peritonitis may demand surgical intervention. (See *APPENDICITIS*, volume i.)

When there is severe localized pain, tenderness, and a tumor present in the right iliac region, with the constitutional symptoms of suppurative inflammation, an early operation is demanded to evacuate the pus. This should be done as early as the third day when possible. Delay is more dangerous than operation. R. Winslow (*Va. Med. Monthly*, May, '91).

One ought not to seize on and explore every perityphlitic abscess, more particularly when the proof of its existence is doubtful and only a mere suspicion. When general peritonitis sets in as a complication, surgical treatment is necessary. Ewald (*Berliner klin. Woch.*, No. 18, '91).

Resection of the cæcum recommended when it is perforated. Von Winiwarter (*Ann. de la Soc. Méd.-chir.*, June, '92).

Colon, Dilatation of.

Symptoms.—Apart from the symptoms of any primary condition that may be operative, dilatation of the colon is characterized especially by distension of the abdomen of varying degree, yielding a tympanitic note on percussion. Constipation, further, is a prominent feature,

and may be marked. Sometimes there occur in association numerous small, liquid stools, together with ungratified desire for or ineffectual effort at defecation. There is also general discomfort in proportion to the degree of distension and the resulting displacement and interference with function of adjacent organs. Bladder, uterus and appendages may be crowded into the pelvis; lungs, liver and heart pushed high up into the thoracic cavity. Digestion is naturally deranged, nutrition suffers, weight is lost, and the quality of the blood deteriorates.

The symptoms of atony of the intestines are marked constipation, headache, vertigo, nausea, and pains in the back and loins. Nervous symptoms are often present. The signs are marked tympany and sometimes the ability to detect the distended colon and fecal masses by palpation. By giving an enema of 6½ to 9½ fluidounces of water, splashing can be heard, while normally 1 pint will be required to produce the sound. Friedenwald (*Med. News*, Aug. 11, '94).

Introduction of a large quantity of water into the intestine in order to diagnose a condition of atony or dilatation recommended. From 1 to 1¼ pints are necessary in order to produce the splashing sound in the normal intestine, perceptible in the neighborhood of the transverse and descending colon; while only ¾ or ⅝ pint will produce the sound if there is atony or dilatation; and in such a case it is perceptible first in the sigmoid flexure, then in the transverse colon, and finally in the entire large intestine. Change of position produces a succussion-sound, and dilatation of the sigmoid flexure may be ascertained, which may be beyond the median line. In the same manner displacement of the transverse colon may be determined, and if simple atony only is present the splashing will be heard in the normal position of the colon, while if there is also displacement the sound will be heard under the umbilicus. It is indispensable to evacuate the intestine with a purgative

before performing this lavage. In catarrh of the intestine the water will return charged with mucus and false membrane, while if the intestine is normal the water will be clear or will contain only some slight epithelial *débris*. Boas (Deut. med. Zeit., Jan. 15, '95).

A very characteristic group of symptoms is present in congenital idiopathic dilatation of the colon. Chief among them and the first to appear are two, viz.: constipation and abdominal distension. In 22 of the 24 cases published one or both of these was witnessed within three months, and nearly always within a few days after birth. Generally it is noticed that within a few days after birth the child tends to be much constipated. In a few cases several weeks or even as long as three months appear to have elapsed before the trouble with the bowels began. In one patient there was never constipation. In nearly half the cases constipation was the first symptom noticed, although in most of these distension of the abdomen developed very soon after. In almost all of the remaining cases the development of constipation and of distension seems to have been simultaneous. J. P. C. Griffith (Amer. Jour. Med. Sciences, Sept., '99).

Etiology.—Dilatation of the colon may arise from a variety of causes, the essential element being invariably an atonic state of the muscular coat of the bowel.

This may result from long-protracted catarrhal conditions, from fecal accumulation, and from other forms of chronic intestinal obstruction, such as the presence of neoplasm, or of a foreign body, or of constriction from without or within, and the like.

Atony of the intestine separated from chronic constipation, which is often only a symptom of the former condition. The atony usually affects the colon, which is unable to expel the feces. It may be primary, as the result of improper diet, sedentary habits, or a too frequent use of cathartics; or it may be secondary to many disorders, as obesity, disease of the heart, lungs, or liver, typhoid fever

and other intestinal diseases, or organic nervous diseases. It is often found in childhood and may be congenital. Friedenwald (Med. News, Aug. 11, '94).

In cases of marked tympanites the distension is practically confined to the large intestine, and it would appear that the obstruction to the escape of flatus is due to the downward pressure of the descending colon and sigmoid flexure upon the upper portion of the rectum, forcing the folds of Houston one upon the other, and bringing about, in this way, what is for the time in effect an impermeable stricture.

The most rational method of relieving this obstruction and liberating the imprisoned gas is the inversion, or partial inversion, of the patient, and removal through the aid of gravitation of the pressure from above, which has converted the mucous folds referred to into an absolute obstruction.

While the knee-chest position may answer best in cases of extreme distension, the placing of the patient upon the side, with elevation of the foot of the bed, will commonly secure relief in cases of moderate distension. Leslie M. Sweetnam (Annals of Surg., Mar., '96).

At times the condition is present from early life and in rare instances it has been thought to be congenital.

Cases fall into four categories: (1) the rarest, those undoubtedly of congenital origin, of which the author's case is only the fifth on record; (2) those in which the symptoms come on a few months after birth—these cases are closely allied to the preceding; and (3) those developing some years after birth, but distinct from (4) those only occurring in adult life. The cause regarded as being purely mechanical. The whole of the colon may be dilated, but the sigmoid flexure is almost invariably affected, and from this point the dilatation spreads backward to a varying extent of the colon. Treatment has been most unsatisfactory. Purgatives and enemata have little effect, and lead to increased suffering, while massage is dangerous. C. F. Martin (Montreal Med. Jour., Mar., '97).

Hypertrophy and dilatation of the large intestine (Hirschsprung's disease) in the majority of cases is a congenital disease and the patients rarely reach an advanced age, since gastro-intestinal disturbances develop only too readily during the first year of life, owing to excessive putrefaction in the stagnant faeces. If the patients survive the first years, the intestinal musculature may accommodate itself to the wide lumen and there may be no further trouble except that intercurrent attacks may endanger life. The majority of patients are males who suffer from a most obstinate constipation and perhaps never have a movement without the use of an enema. Inflammatory processes in the intestines are common owing to the irritation of impacted faeces and much blood and mucus may be voided. At the same time the tympanites may reach marked degrees and the patients may be a menace to themselves and their surroundings by the frequent discharge of extremely foetid gas. From time to time there may be attacks of obstruction with complete cessation of peristalsis. Objectively the enormously distended loops are clearly visible through the emaciated parietes and gurgling may be very audible. In children the growth of the rest of the body is retarded, and the thorax eventually becomes deformed. The writer reports a few cases of his own, and dwells at length on one where laparotomy was performed for supposed obstruction. There was no impediment to the passage of faeces, but a loop of colon was firmly caught in the pelvis. The only interference consisted in freeing this loop, but the patient improved wonderfully and no longer suffered from attacks of obstruction. In most cases, however, an operation is not indicated, except to clear the diagnosis or to correct a kink, etc., which may be the cause of an obstruction. The daily use of very large enemas of water or oil is indicated in most instances. A colostomy may be in place when the attacks of obstruction frequently repeat themselves or where an ulcerative colitis has developed, but great care should be exercised, since there is a tendency for

the sutures to tear out owing to the great weight of the colon. L. Kredel (*Zeitschr. f. klin. Med.*, Vol. 53: *Medical News*, Aug. 27, 1904).

When dependent upon obstruction, of whatever character, it follows hyper-



Fig. 1.—Photograph of a boy, aged 3½ years, with congenital idiopathic dilatation of the colon.

trophy in consequence of the constant efforts at expulsion of the accumulating contents. In some instances no form of obstruction has been discovered, and it may be that in these the condition may have been dependent upon an hypoplasia of the muscular coat of the bowel. The

gut may attain enormous proportions and it may undergo extraordinary displacement and distortion.

Case of gigantic intestinal diverticulum seen in a boy aged 14. The abdomen began to swell soon after birth and continued till death, which followed an operation for relief of the condition. It was found at the autopsy that a large diverticulum connected with the rectum. Maas (Centralb. f. Gynäk., Apr. 22, '88).

It also becomes the repository for a vast accumulation of fæcal matter, and it may, through acute dilatation of the bowel, attend inflammation of the peritoneum or this mechanism lead to a fatal issue of some organ with a peritoneal covering.

Treatment.—The treatment consists in the prevention of the causative conditions when possible, of their removal when present, and of their effects when these have developed, with a proper regard, of course, for the general state of the patient. Thus, constipation is to be prevented by attention to and regulation of the diet, and to be judiciously corrected when it exists, though the abuse of purgatives is to be carefully guarded against. Accessible strictures should be dilated, obstructing neoplasms and foreign bodies removed, and constricting bands and confirming adhesion freed. The fæcal accumulations are best removed by enemata of either water, warm or cold, alone, or with the addition of soap-suds, castor-oil, olive-oil, cotton-seed oil, or turpentine.

Large quantities of olive-oil, varying from a pint to a quart, in divided doses, have been successful in fæcal accumulations. E. W. Mitchell (Cincinnati Lancet-Clinic, Jan. 17, '91).

Massage is capable of effecting good results in suitable cases, and electricity also at times. The diet should be preferably concentrated, and food requiring intestinal digestion, or giving rise to a

bulky and coarse residue, must be avoided. Of drugs, strychnine is, perhaps, the best, conjoined or not with belladonna, in accordance with the presence or absence of irritability of the bowel.

Enteroptosis.—Descent of the intestines from their position is a frequently overlooked condition occurring coincidentally with gastropsis, nephroptosis, and prolapse of other abdominal organs. It constitutes the disorder termed by Glénard "splanchnoptosis." In rare cases the condition may be congenital. Predisposing causes may be relaxation of the abdominal walls from numerous pregnancies or from rapid emaciation; traumatism; improper use of cathartics; and, in addition to these general causes, there must be in every case a relaxation of the ligaments and the mesentery. The condition, even when extreme, may be without symptoms, but usually there exist signs of disordered functions, which may affect the general nutrition. The appetite is generally lessened, and there are sensations of weight and fullness, with acid eructations. In some cases the bowels move daily, but more often constipation prevails, sometimes alternating with diarrhoea. Excessive flatulence is usual, and not rarely there is membranous enteritis. As a result of these abnormal conditions there are loss of flesh and a feeling of weariness, and the patient has the appearance of one suffering from a wasting disease. Nervous symptoms are marked, with headache, loss of sleep, and other sensations, which might lead to a diagnosis of neurasthenia or hysteria. The course of the disease is chronic. (Boas.)

Enteroptosis can be cured in many instances. Personal plan of treatment is to strap the stomach with strips of adhesive plaster. Adhesive plaster is preferred to the bandage in these cases be-

cause the patients are thin, and it is difficult to fit a bandage and keep it snugly applied. Irritation of the skin can be overcome by the application of Unna's zinc plaster before putting on the adhesive plaster. Nervous dyspepsia and enteroptosis are thought to be closely allied. It is remarkable how quickly the nervous dyspepsia can be relieved by treatment directed to the cure of the enteroptosis. A. Rose (Med. Record, Jan. 5, 1901).

The greater one's experience with enteroptosis, the more conservative and guarded his statements as regards treatment and recovery. All floating kidneys and dislocated stomachs are not to be stitched into place; in fact, only a well-chosen few are benefited by such operation. In most cases of general enteroptosis nephrorrhaphy will be of no benefit.

In gynecological practice a large number of women with displacements and torn perinei have distressing nervous symptoms. The specialist, taking a narrow view of the case, performs anterior fixation, uses pessaries, repairs the perineum, and is disappointed in the results of his treatment. Many of these cases are enteroptotics, and the symptoms are as much dependent on dislocated stomach, kidneys, and intestines as upon retroversion and ante flexion. Operation is advisable in cases accompanied by hydronephrosis and Dietl's crises, in which these are pure mechanical disturbances resulting from a kinking or twisting of the kidney-vessels which could occur only when this organ was dislocated.

Abdominal bandages or belts with properly applied pads may relieve symptoms in some cases. They should be applied with the patient in the knee-chest position or lying on her back, with the hips elevated. Reclining in bed often relieves the dragging sensation. In some cases in which the stomach symptoms are prominent, occasional lavage and the use of dilute hydrochloric acid (if there is subacidity) are useful. Exercise and massage of the abdominal muscles are of great value, but can seldom be satisfactorily carried out. Many

cases improve remarkably under the use of tincture of nux vomica. The method in vogue in Dr. Dock's clinic is to begin with 10 or 15 drops before each meal, increasing 1 drop daily until as high as 70 or 80 drops are taken. This medication should be combined with overfeeding. The general tone of the system is greatly improved, the nervous symptoms especially being relieved; the patient puts on flesh, and in every way, with the exception of the dislocations, is greatly benefited.

If the stomach is dilated or if there is retention of food as a result of kinking in the duodenum, gastric lavage should be used as indicated. There must be a great deal of individualizing in the treatment of this condition. J. R. Arneill (Amer. Jour. Med. Sci., Apr., 1901).

The treatment of enteroptosis should be directed to strengthening the general constitution by proper dietetic, hygienic, and therapeutic means. Iron, strychnine, arsenic, massage, electricity, medicated baths, and surf-baths, all have a proper sphere of usefulness. Very much comfort can be afforded the patient by a correctly applied plaster bandage, as first advocated by Dr. Achilles Rose, of New York, and Dr. H. Warren Lincoln, of Brooklyn, N. Y. This bandage is put on the nude figure of the patient in strips. A special straight-front corset which has a tendency to press the intestines upward—thereby making a cushion for the stomach, colon, and kidneys to rest upon—is also very useful. If the patient is emaciated, a fattening cure should be undertaken. Surgical interference must be avoided. J. C. Hemmeter (Inter. Med. Mag., March, 1902).

Colon, Inflammation of.

Synonyms.—Colitis; catarrh of the colon.

Definition.—Inflammation or catarrh of the colon may be part of the same process involving other parts of the intestinal tract as well, or it may be more or less localized to the large bowel.

Symptoms.—These differ in accordance with the nature and the continuance of the causative agent and with the

extent and intensity of the morbid process. The most distinctive manifestation is looseness of the bowels. There may be many movements hourly. The stools are usually small and they commonly contain mucus; at times they are large and contain much fluid. They may be blood-streaked. Often there is abdominal pain, of varying degree, and sometimes colicky in character. Not uncommonly there is some degree of tenesmus. There may be frequent ineffectual desire for stool. The temperature may be elevated, and in cases of acute onset there may be nausea and vomiting and marked constitutional depression. Appetite is generally lost, though in chronic cases it may be preserved. In long-standing cases nutrition fails and emaciation and weakness may be marked.

It depends, like other forms of mucous-membrane disturbance, upon the action of irritants, either generated within the body, such as the products of fermentation or other toxic substances resulting from some inadequacy of function, or introduced from without, such as indigestible or decomposing food, or an excess of food.

Effect of temperature on intestinal fermentation studied, using the others in the urine as an indication of the extent of the process. Individual predisposition was found to exert a decided influence. A draught of air over the abdomen of a sleeper often increased fermentation, although some subjects were unaffected. Local chilling with ice always produced an increase of fermentation. L. Cantu (*Centralblatt f. Bakter. und Parasitenk.*, Aug. 15, '94).

Excessive intestinal fermentation or putrefaction, either from excessive formation of moderately-toxic bodies or through the temporary appearance of bodies of greater toxicity, may cause various forms of toxæmia.

Many minor ailments are connected either with excessive intestinal fermenta-

tion or perhaps with modified intestinal fermentation, such as diarrhœa with offensive and perhaps fermented stools, and flatulence with abdominal pain and distension. Also anæmia, malnutrition, vomiting, headaches, the so-called "biliousness," and many nervous manifestations. R. N. Chittenden (*Dietetic and Hyg. Gaz.*, June, '96).

There are two forms of intestinal fermentation produced by micro-organisms, the one of the carbohydrates, the other of the proteids present in the gut, and they are mutually antagonistic to one another. The fermentation of carbohydrates leads to the evolution of gases, and to the formation of organic acids. The gases cause discomfort and the acids interfere with pancreatic digestion, but the products formed are not very poisonous nor irritating. On the other hand, the fermentation of proteid bodies caused by bacteria results in the formation of gases of more varied character, though in some cases no gas may be evolved, and in the production of many derivatives of a poisonous and dangerous action. The fæces are most offensive. In acute cases there are febrile symptoms; in chronic, depression and nervous affections. Bartley (*Brooklyn Med. Jour.*, Aug., '96).

In mucous enteritis the characteristic discharges are simulated only by those of tubercular enteritis. P. F. Barbour (*Amer. Pract. and News*, xxx, p. 11, 1900).

It may be acute or chronic and of varying degrees of severity.

Prognosis.—The prognosis varies with the character of the causative agent and the general condition of the patient.

Treatment.—The treatment is best conducted with the patient in bed. Under such conditions recovery may follow mere restriction of the diet. This may include milk, strained broths and soups, beef-tea, beef-juice, farinacea, and possibly soft-boiled eggs. In aggravated cases it may be well to withhold all food for a time and give only albumin-water or barley-water.

When the condition is attributable to improper food or to the presence of irritating intestinal contents an initial dose of a teaspoonful each of castor-oil and camphorated tincture of opium may be given.

Opium in some form, or morphine or codeine, may be required when the bowel-movements are unduly frequent and attended with distress or pain. The anodyne may be administered by the mouth or by the bowel in the form of an enema of starch-water with tincture of opium. In many cases irrigation of the bowel, from three to five times a day with from 1 to 3 quarts of fluid, serves a useful purpose. Simple warm water may be used or boric acid (5 grains to 1 ounce) or thymol ($\frac{1}{2}$ grain to 1 ounce) or silver nitrate ($\frac{1}{2}$ grain to 1 ounce) or mercuric chlorid (1 to 10,000) may be added in suitable proportion, care being taken that those solutions containing substances capable of toxic activity be not retained.

Intestinal antiseptics may also be given by the mouth with advantage. Creasote may be administered in emulsion, in milk, or in wine, in doses of from 1 to 5 minims every three hours, salol in doses of 5 grains, betanaphthol in doses of from $2\frac{1}{2}$ to 5 grains.

Salol is of considerable power in intestinal indigestion (pain, flatulence, and diarrhœa); 2-grain doses of salol every hour rapidly relieve the symptoms. Milk diet is the best for those suffering from excessive intestinal putrefaction,—preferably, however, mixed with some carbohydrates and a little meat. Pease and beans, oatmeal, whole wheat, Indian meal, etc., must be excluded. Rice or farina may be allowed if well cooked. Eggs, if soft boiled, are well borne. A pure meat diet often brings relief from the symptoms, if persisted in for a few days. Fats, as a rule, do no harm. Physical overfatigue should be avoided.

Herter and Smith (N. Y. Med. Jour., July 13, 20, '95).

Local or general antiseptics of the gastro-intestinal tract by means of medicaments of the aromatic series (benzonaphthol, naphthol, naphthalin, salol) is in reality impossible. These substances do not necessarily break up in the alimentary canal, but they may accumulate or be eliminated without undergoing any decomposition. Bardet (Bull. et Mém. Soc. de Thérap., Nov. 27, '95).

Monnet's saccharin No. 3, a saccharinate of sodium, containing 90 per cent. of pure saccharin, given in doses of from 15 to 30 grains once daily about two hours before the principal meal, must take rank among the best intestinal antiseptics. Descheemaeker (Echo Méd. du Nord, April 10, '98).

The best form in which to administer an intestinal astringent is one by which the astringent principle is slowly liberated in the intestinal canal so as to avoid any irritant effect upon the stomach, and also to subject the lower intestinal tract to the influence of the remedy. Tannopin represents an efficient and reliable intestinal astringent, which, owing to its innocuousness, is well tolerated by the smallest children, and which, while an active astringent, is entirely free from irritating effects upon the intestinal canal. G. C. H. Meier (Boston Med. and Surg. Jour., Sept. 21, '99).

The salts of bismuth may also be employed, the subnitrate or the subcarbonate in doses of from 10 to 30 grains; the salicylate or the subgallate in somewhat smaller doses.

A pill of silver oxide, $\frac{1}{8}$ grain, and extract of belladonna, $\frac{1}{4}$ grain, after each meal, often acts admirably.

Use of tannalbin in cases of acute and chronic intestinal catarrh, and also in tubercular diarrhœa, strongly advocated. Tannalbin is a brown, tasteless powder, containing about 50 per cent. of tannic acid. It is insoluble in the mouth and stomach, but on meeting with the alkaline secretions of the intestines it is

resolved into its original elements, tannin and albumin.

The dose for children varies from 4 to 8 grains. Vierordt (*Deut. med. Woch.*, No. 25, '96).

Ichthyol strongly recommended in intestinal disorders, particularly those which accompany affections of the genito-urinary tract in women. The dosage is 4 or 5 grains a day, preferably in keratin-coated pills, which are believed to pass through the stomach undissolved. The medicine is best given some little time after meals. Good results obtained in cases of diarrhœa. The best results were in cases of rebellious constipation. Guintzburg (*La Méd. Mod.*, May 13, '96).

Pill of $1\frac{1}{2}$ grains of ichthyol every hour or two recommended in all severe cases of acute intestinal catarrh, also in all cases of chronic catarrh of the rectum and hæmorrhoids in which there is a great tendency to tympanites with foul evacuations. This treatment is very efficacious. Lange (*Allg. med. Central-Zeit.*, No. 3, '97).

Ichthalbin used in 28 cases of sub-acute and chronic enteritis, in doses up to 2 drachms daily for a long time. It caused no constipation, and no symptoms of irritation of the intestines or kidneys were observed. Metabolism tests showed that it facilitated albumin intake and diminished the nitrogen elimination via the urine. Daily doses of 23 to 45 grains produced an excellent effect in simple chronic enteritis and in those showing peritonitis or tuberculosis. Rolly (*Merck's Archives*, Aug., 1900).

Case in which colitis was treated by valvular colostomy and irrigation as proposed by Keith in 1885, to spare the mucous membrane of the colon from contact with the fæcal matter, and facilitate local treatment. The first step in the treatment consisted in performing a cæcal colostomy, a $1\frac{1}{2}$ -inch incision being carried through the abdominal wall parallel with the right Poupart ligament and an inch internal to its outer part. The cæcum, which presented, was then opened sufficient to admit a fair-sized soft-rubber catheter,

and three tiers of sutures were placed above and below the orifice to inclose the cæcal wall. The ends of those last introduced were left long and carried through the margin of the abdominal incision to insure close contact of the cæcum with the abdominal wall. Irrigation of the colon was begun at once, and several quarts of 0.01-per-cent. solution of silver nitrate were injected through the catheter. This was followed by a 0.5-per-cent. salt solution. For the first three days this washing was done twice a day, for the next eleven days once a day, and the strength of the silver solution increased to 0.02 per cent. for the remaining time every other day. Complete recovery followed, and the artificial anus finally closed. A small ventral hernia has appeared at the site of the operation, however, and the intermuscular incision of the abdominal wall will therefore be resorted to in future operations. P. R. Bolton (*Med. Record*, Mar. 16, 1901).

The attack of pain which precedes the passage of mucus should be treated by a hypodermic of morphine and atropine, and thorough evacuation of the bowels promoted by large doses of castor-oil by the mouth, and high enemas of oils or of alkaline solutions. A carefully selected diet to suit the individual case should be ordered, after a chemist examination of the stomach contents has been made. Digestion should be assisted and fermentation allayed. The bowels should be kept open by means of oils by the mouth, which have the double office of laxative and lubricant. Suitable support should be applied to overcome any ptosis of the abdominal organs. Local treatment should be administered by means of astringent enemas and oils, and topical application of the same when necessary. The patient should get sufficient rest in the recumbent position, and when practical a change to the air of the mountains or seashore. Jesse Shoup (*American Medicine*, August 27, 1904).

Colitis, Mucous.

Synonyms. — Membranous enteritis; mucous colic; tubular diarrhœa.

Symptoms.—There occurs occasionally in hysterical women and neurasthenic and hypochondriacal men a condition characterized by the discharge from the bowel, from time to time, of membranous or tube-like material, in conjunction with abdominal pain that may reach a high grade of intensity. Apart from the paroxysms, the bowels are often constipated; sometimes they are loose; they are rarely regular. The stools usually contain mucus. The matters expelled from the bowels consist principally of mucus, although at times fibrinous and cellular elements have been found. They sometimes resemble and may readily be mistaken for sheets or casts of the bowel. It is believed that they are derived from the large intestine. Sometimes they appear in strings or shreds. They are believed to be the product of an abnormal secretion of the mucous glands of the bowel.

Abdominal pains regarded as the most prominent symptom in membranous colitis. These pains, which often precede the evacuations by some hours, are frequently localized in the left side of the abdomen and follow the course of the descending colon and of the sigmoid flexure. The pains may become generalized or may be most decided near the transverse colon, or, at other times, near the cæcum, generally ceasing after the evacuations, though the abdomen remains very sensitive. Besides these spontaneous pains there is pain upon abdominal palpation in different portions of the large intestine and particularly the region of the sigmoid flexure. In such cases the pain is at its height in the entire left iliac fossa. Touvenaint (*Revue Inter. de Méd. et de Chir.*, July 25, '95).

Membranous enteritis is not inflammation, either acute or chronic. It is a secretory neurosis affecting generally the mucous follicles of the colon and their regulating nerves, but sometimes involving the corresponding elements of

the small intestine, bladder, uterus, and vagina. There are correlated sensory, vasomotor, and motor disturbances. It constitutes a comparatively rare local manifestation of a general neurosis, usually hysteria or neurasthenia. Glentworth R. Butler (*N. Y. Med. Jour.*, Dec. 28, '95).

Case of intestinal calculi in a young woman of 31 years, arthritic and neurotic, who had suffered for six years from digestive disorders in the form of flatulent dyspepsia, with dilatation of the stomach. The symptoms of muco-membranous enteritis intervened, with sharp abdominal pain, tenderness along the course of the colon, and obstinate constipation. After passing a large amount of muco-membranous material over a period of six or seven months the patient began to notice small stones in the passages. Most of these stones were about the size of orange-seeds, the largest as big as a nut, and their discharge lasted two or three weeks. The concretions were of a yellowish-white color, and very friable, some of them presenting conical elevations on their surfaces, others smooth. They were homogeneous on section, and did not contain any central nucleus. Chemical examination showed the stones to be composed principally of carbonate of lime and phosphates of magnesia, with a small amount of organic matter, iron, and water. Mongour (*Comptes-Rendus de la Soc. de Biol.*, Feb. 28, '96).

Diagnosis between mucous colic and membranous catarrh of the colon can only be made by a careful study of the discharges. In mucous colic the secretion of mucus is periodical, and the stools in the intervals are normal and free from mucus. If the stools contain mucus in the intervals, then it is membranous colitis. R. Schultz (*Münchener med. Woch.*, Apr. 24, 1900).

Etiology.—The attacks are induced, as a rule, by emotional disturbances and errors in diet, and they recur with varying frequency, lasting from a day or two to a couple of weeks.

Membranous enteritis has been found to depend on the presence of larvæ in

the intestinal canal. Henschen (Wiener klin. Rund., No. 33, '96).

Membranous colitis is a functional neurosis and is an intestinal manifestation of neurasthenia. The proper treatment is that of nerve-prostration. Mendelson (Med. Record, Jan. 30, '97).

Membranous colitis considered a symptom of enteroptosis, and is due to functional disturbance of the liver. Hepatoptosis leads to altered vascular tension in the liver, and so to a diminished secretion from mucous membrane of the intestine and precipitation of the mucin by the acids in the intestine. The author is in favor of a meat diet and saline purges. Glénard (Acad. de Méd., Apr. 20, '97).

Membranous colitis regarded as an hypersecretion of mucus in women of a neuro-arthritis type who suffer from enteroptosis. The constipation is to be treated by giving copious enemata and castor-oil. Intestinal antiseptics, such as naphthol, resorcin, and salicylate of bismuth, should be given. Mathieu (Semaine Méd., p. 226, '97).

Secretion-neurosis is of neurotic origin and course. Both secretion-neurosis and enteritis may co-exist. Secretion-neurosis of the colon occurs chiefly in neurotic females (80 per cent.). It is closely associated with genital disease and is frequently preceded by constipation. The continuation of the disease is partly due to an irritable, vicious habit of excessive epithelial activity. The disease is characterized by colicky pains, with the evacuation of mucous masses; it is not fatal and is variable and erratic in the number of attacks, with an indefinite prognosis. Chemically the evacuations consist of mucin and an albuminous substance. Microscopically there are seen hyaline bodies, cylindrical epithelium, cholesterol crystals, triple phosphates, round cells, various kinds of micro-organisms, and pigment. Secretion-neurosis of the colon is comparable to the secretion-neurosis of the endometrium (membranous dysmenorrhœa) or bronchial croup and appears to be limited chiefly to the part of the colon supplied by the inferior mesenteric ganglion: *i.e.*, to the fœcal reservoir (the left half of the transverse

colon, the descending colon, the sigmoid, and the rectum). Bryan Robinson (Mathews's Jour. of Rectal and Gastro-Int. Dis., Jan., '98).

They may be attended with acute outbreaks of hysteria, hypochondriasis, or melancholia.

The nervous complications of mucous-membranous enteritis are most varied, among those noted being dyspnoea, pseudo-angina pectoris, generalized trembling during digestion, inaptitude for work, headache, aphasia, temporary amnesia, infantile convulsions, coma, etc. A. Mathieu (Gaz. des Hôp., Oct. 27, '94).

Two cases of membranous colitis observed presenting hysterical—one epileptic and the other choreic—symptoms dependent on the condition of the intestine and disappearing as the state of the latter improved. F. Cantru (La Méd. Mod., Jan. 12, '95).

Prognosis.—The condition is often an obstinate one and extremely unyielding to treatment.

The prognosis of membranous colitis is not generally grave, especially when the attacks are not very intense or when they occur at short intervals. However, the disease constitutes a serious complication, for it contributes greatly to produce cachexia and it is very rebellious to treatment. Touvenaint (Revue Inter. de Méd. et de Chir., July 25, '95).

Prognosis of membranous colitis not especially favorable, since there is little prospect of ultimate cure unless a radical change can be effected in the circumstances and surroundings of the patient. O. D. Doane (Med. Sentinel, Sept., '95).

Treatment.—Treatment must be directed to the underlying state, although the condition of the digestive tract must not be ignored. Nervines, tonics, intestinal antiseptics, and supporting measures generally are the agents indicated. Asafetida, sumbul, valerian, iron, strychnine, hydrogen dioxide, creasote, guaiacol, singly or in varying combination, are sometimes useful. The best results are to be expected from rest and a

milk diet, with massage and electricity, and later forced feeding and a gradual return to the ordinary mode of life.

In the treatment of membranous colitis rest in bed is essential, with abdominal friction to soothe the pains, using a soothing liniment or camphorated oil to which laudanum has been added. If the pain is very acute, opiates may be given in small doses, either as a potion or an enema. Letteff recommended the use of copious irrigations with hot solutions of nitrate of silver in the proportion of 1 to 2000, or even 1 to 1000. Touvenaint (*Revue Inter. de Méd. et de Chir.*, July 25, '95).

In membranous enteritis or mucous colic abundant nourishment is of the greatest value. An ample mixed diet, containing plenty of vegetables, should be given. In severe attacks, rest in bed, warm poultices to the abdomen, a cleansing enema of warm water, and afterward the administration of codeine or opium, with or without belladonna, and light food, is the best treatment. In the intervals free from pain the treatment consists in the methodical use of enemata of oil, as suggested by Kussmaul and Fleimer. One-half to 1 pint of oil at blood-temperature is injected into the bowel at night. The patient should try and retain the enema all night. The oil should be injected every night for three weeks; every other night for three weeks; twice a week for four weeks; finally a weekly injection for five or six months. In addition, patients must accustom themselves to a regular morning evacuation. The results achieved by this method of treatment are very satisfactory. Max Einhorn (*Med. Record*, Jan. 28, '99).

As most of the food taken during the day reaches the large intestine by the following morning, remedies to heal ulcers of the colon should be given before the patient is allowed to have any nourishment, the breakfast being postponed for a few hours. By this means, and an early morning injection, cases rebellious to other methods have been cured. Richter (*Ther. Monats.*, Mar., '99).

The first indication for treatment is to

relieve the colonic symptoms proper. Nothing is so soothing to the tenesmus and the general abdominal distress as irrigation of the colon with decinormal saline solution at a temperature of 110° F. This irrigating fluid should contain 5 drops of oil of peppermint to the pint of water. The irrigation should be given with the Kemp rectal irrigator, and several gallons of the saline solution should be used. This irrigation may be used as often as once in twelve hours. Unfortunately such treatment is not curative. In small or alternative doses of castor-oil the physician possesses a remedy which is believed to be distinctly curative in this affection. Castor-oil should be given in an emulsion, each tablespoonful of which contains $\frac{1}{2}$ drachm of the oil. It should be given half an hour before, or more than one hour after, meals, and should be continued for months at a time. Another useful remedy is nitrate of silver given in doses of $\frac{1}{4}$ grain of the silver salt, combined with 9 minims of turpentine, in capsules, three times daily. After a course of this medication for six weeks, sulphate of copper should be substituted for the silver salt, and should be given in doses of $\frac{1}{4}$ grain. Abdominal massage and out-door exercise are useful adjuncts. These patients should be told simply to exclude beans, corn, spinach, and the woody vegetables from the diet. W. H. Thomson (*Med. Record*, Mar. 10, 1900).

Mucous enteritis is a syndrome, acute or chronic, characterized by constipation, the passage of glairy mucus, and by paroxysmal crises. It is commonest in women, and is doubtless greatly influenced by heredity. The writer reports three cases, in two of which recovery was only partial and not permanent. The third case terminated favorably. All were marked by constitutional depression, nervous symptoms, and hysteria. The first two cases were caused by strong lifting movements, the third by a fall, the traumatism affecting the region of the caecum or colon. The author's treatment is tonic by iron, strychnine, and arsenic, the last under the form of sodium cacodylate; gently laxative by liquorice powder, sulphur,

castor-oil; antispasmodic, by cannabis indica. An old remedy, buckthorn, has proved valuable. Intestinal lavements may be required in fœtid diarrhœa or putrid fermentation. In pain the opiates should never be used, but mustard plasters, hot compresses, etc. The diet should be that usually prescribed in hyperchlorhydria. Gentle massage of the abdomen, warm baths, rest in the open air, and suggestive therapy are all valuable. Vinay (Lyon Medical, October 30, 1904).

Tumors of the Cæcum, the Colon, and the Duodenum.

New growths in the intestinal tract are much more common in the large than in the small division. Of the large intestine the rectum is most frequently attacked; then in the order of frequency the sigmoid flexure, the cæcum, and the remainder of the colon. Of the small intestine the ileum seems to suffer most commonly, the duodenum next in frequency, and the jejunum least. The growth is usually primary; less commonly it arises by extension from contiguous disease. Metastasis to other organs is frequent, and rather the more so from the small than from the large bowel. The involvement of adjacent structures and organs also is common.

The most usual variety of neoplasm is carcinoma and especially of the cylinder-cell type; epitheliomata are less common. Sarcomata are rare. The disease occurs a little more commonly in males than in females and rather earlier in life than malignant disease elsewhere, a larger number of cases occurring before the age of 30 than when the disease is situated in other parts of the body. The duration of malignant disease of the bowel averages from six to twenty-four months.

Symptoms.—Among the most conspicuous symptoms of malignant disease of the intestine are anæmia, cachexia,

wasting, pain, indications of intestinal obstruction, fever, and the presence usually of a tumor yielding dullness on percussion. When ulceration occurs the stools will contain blood, pus, and perhaps fragments of the new growth. The associating symptoms will necessarily vary somewhat with the situation of the growth.

Methods to be followed in examining intra-abdominal tumors:—

Tumors through which gases may be detected by gurgling indicate either an involvement of the bowel in the tumor or pressure of the growth on the bowel, with adhesions to the same. If this symptom is coupled with a history of a pyloric cancer or a cæcal growth, it is confirmatory in its indications. Some growths have a disposition to change position, but all growths have one or more attachments, and it is safe to infer that this attachment is to the site at which the neoplasm had its beginning, its movements being only around an arc of a circle. Adhesions may prevent a growth from moving, or anchor a tumor in a locality far from its original point of starting, and here the history of the inflammatory attacks and pain aid in the diagnosis. The character of the pain and the amount and area of tenderness are of great assistance. The withdrawal of free fluid from the peritoneum often shows the presence of a tumor before undetected. A. H. Cordier (N. Y. Med. Jour., Oct. 26, '95).

Carcinoma of the duodenum is rare.

Among the records of about 18,000 autopsies at Guy's there are reports of 10 cases of primary malignant growth of the duodenum: 4 carcinomata and 6 sarcomata. Together with collected cases, a total of 22 primary malignant growths are described: 13 carcinomata and 9 sarcomata. Secondary deposits of malignant growths are very rarely observed in the duodenum. Perry and Shaw (Guy's Hosp. Reports, vol. 1, p. 171).

The symptoms of carcinoma of the cæcum have their importance because, by reason of the small number of cases

that have been diagnosed as such during life and have been reported, little attention has been given them in the classical works on general or special surgery. The commencement of the disease is usually remarkable by its latency, but always comes to an end as soon as the growth has developed sufficiently to be made out by palpation, and at this time the period of full development has been reached. The symptoms which first draw the physician's attention to the cæcum do not always follow in the same order, but in the order of frequency of their apparition they may be classed as follows: (1) pain; (2) alternating diarrhoea and constipation; (3) loss of flesh; (4) dyspeptic disturbances; (5) intestinal hæmorrhage. Occasionally the functional symptoms are absent, and only those are met with which occur when it has arrived at its full development, and thus one finds reported cases in which the tumor in the right iliac region was detected before it had given rise to any other symptom, while in one case the affection made its presence first known by the formation of a fecal fistula.

The physical symptoms are observed when the carcinoma of the cæcum has attained its full development, and they characterize the disease. By far the most important is the appearance of a tumor in the right iliac fossa. In the early stages it is movable under the abdominal wall and also over the deeper structures. The neoplasm, which in the beginning is limited to the intestine, will finally invade the pericæcal cellular tissue and throw out narrow adhesions between the diseased structures and the iliac fossa, or the neoplasm may become adherent to the abdominal wall. Later on the lymphatic glands become involved, and their number and size vary very greatly in different cases. After the lymphatics have become greatly involved a large tumor may be felt which may project at a point quite distant from the primary neoplasm, as, for example, at the umbilicus or in the epigastric region. The tumor will now be found to be very adherent, and it may happen that from its size it compresses

the iliac vessels so that an œdema of the right lower limb will arise. C. G. Cumston (*Med. News*, Feb. 16, 1901).

It may be situated close to the pylorus or in the region surrounding the entrance of the choledoch- and pancreatic ducts or close to the jejunum, and the symptoms will vary accordingly. In addition to other manifestations there are anorexia, nausea, vomiting, and pain. When a tumor becomes palpable it will be found in the right upper quadrant of the abdomen, and it is, as a rule, fixed, and little, if at all, mobile upon manipulation or with the movements of respiration. Pain, when present, has a corresponding localization, but it is likely to occur at a later period after the ingestion of food than that of malignant disease of the stomach. When the first or pyloric portion of the duodenum is the seat of the new growth the symptoms may simulate those of pyloric obstruction, among the most distinctive of which are dilatation of the stomach, with vomiting periodically of vast amounts of fluid and partly-disintegrated food, some of which may have been ingested days before. If the neoplasm develop close to the point of entrance of the biliary and pancreatic ducts into the duodenum,—*i.e.*, in the ampullar portion,—jaundice will almost certainly be a symptom in consequence of obstruction to the flow of bile. If the disease be situated beyond this point,—that is, in the jejunal portion,—the vomited material will contain bile and intestinal matters.

Primary cancer of the duodenum has, in the great majority of cases, an annular form, and thus most frequently produces stenosis, the stenotic symptoms varying according to the level at which the growth occurs. Above the ampulla of Vater the neoplasm develops in the first portion of the duodenum and presents a symptomatology almost identical to that of pyloric cancer. In that below

the ampulla, besides the symptoms accompanying stenosis of the pylorus there are signs indicating a reflux of bile and pancreatic juice into the stomach, while in that developing about the ampulla the symptoms approach more or less one or the other of the above forms. When diagnosis is impossible, exploratory laparotomy constitutes the first measure necessary for surgical intervention, which, however, in the greater number of instances, cannot be more than palliative. Pic (*Revue de Méd.*, Jan., '95).

Carcinoma of the cæcum is commonly attended with symptoms resembling those that have been more fully detailed in the consideration of typhlitis: pain in the right iliac fossa, with constipation (perhaps diarrhoea), tympanitis, impaired appetite, coated tongue, bad taste, nausea, and vomiting.

The ileo-cæcal region is a point of predilection for the development of malignant tumors, mostly in the form of carcinoma and local intestinal tuberculosis. The lumen of the gut is diminished and the glands much enlarged.

The onset of malignant disease is very insidious, the symptoms being usually those of typhlitis and coprostasis. As regards treatment, resection and reunion of the divided parts are necessary, but symptoms of acute obstructions are contra-indications. Simple enterostomy is here called for, with resection later on. The extent of the tumor and advanced cachexia are also contra-indications. Körte (*Deut. Zeit. f. Chir.*, B. 40, H. 5, 6, '95).

The tumor that develops, with dullness on percussion, will be found in the right lower quadrant of the abdomen, though capable of a certain range of movement. As obstruction becomes marked, attacks of colic will occur, in consequence of the augmented expulsive efforts of the proximal bowel, which at first undergoes hypertrophy, with subsequent atrophy and atony and dilatation,

while the distal intestine becomes collapsed and empty.

The symptoms of carcinoma of the colon differ principally in localization from those attributable to like disease in the cæcum.

The subjective symptoms of cancer of the large intestine may be divided into four classes: (1) those in which local signs are absent for a long time or throughout, the progressive cachexia being the only thing to arouse suspicion; (2) those in which the local symptoms are indefinite; (3) those of deep-seated stenosing carcinoma in which colicky pains are accompanied by tenesmus and strangury, as frequently seen in cases of rectal cancer; (4) cases in which symptoms of ileus appear in the midst of apparent health or after prodromes of not alarming character. Of greater value than the subjective symptoms is the presence of a palpable tumor. Contrary to the teaching of the text-books, the tumor is not always movable. The occurrence of stricture is a symptom of the greatest value. I. Boas (*Deut. med. Woch.*, Feb. 15 and 22, 1900).

A suggestive diagnosis of this condition is alone possible. The symptoms that may be taken as fairly suggestive of this syndrome are: (1) the prominence of digestive derangements in association with other symptoms indicative of colon disease; (2) these symptoms arise in connection with the bowel, primarily, and in connection with the stomach, secondarily; (3) the symptoms associated with obstruction of the hepatic flexure are more acute than those situated farther along the colon, and usually do not occur until the patient has already shown signs of constitutional disease; (4) pain is more common and more acute in disease of the cæcum, ascending colon, and hepatic flexure than when the growth involves other segments of the large intestine, and the pain is usually felt over the seat of the disease; (5) while the symptoms may suggest disease of the colon up to and including the hepatic flexure, the absence of any tangible growth in the right iliac and lumbar regions will

point to implication of the hepatic flexure. A. E. Maylard (Edinburgh Med. Jour., May, 1902).

The greater mobility of the large bowel, however, permits of freer movement on the part of the tumor, with greater displacement and greater variability in situation. The closer the growth to the rectum, the more pronounced the change in the conformation of the stools, which may become characteristically narrow in caliber or band-shaped or ribbon-shaped.

Sarcoma of the intestine is more common than text-books indicate. It much more frequently affects the small than the large intestine. The ileum seems to be its favorite location. Sarcoma rarely produces stenosis. Dilatation is more frequent. Usually it grows from one side of the bowel entirely. The diagnosis is difficult and will always remain obscure; still if a smooth, freely movable tumor be found in the abdomen, unless it can be otherwise satisfactorily accounted for, one should be reminded of the probability of sarcoma of the intestine—especially if there is also present the general picture of sarcoma, with its peculiar anemia. C. Van Zwalenburg (Jour. Amer. Med. Assoc., Mar. 9, 1901).

Under favorable conditions it may be possible to recognize malignant disease of the sigmoid flexure by means of manual exploration through the rectum or with the aid of the sigmoidoscope.

Diagnosis.—Carcinoma of the duodenum is to be differentiated from carcinoma and ulcer of the stomach, from duodenal ulcer, from gall-stones, and from new growths or enlarged glands compressing the duodenum from without. From the two forms of ulceration named, it differs in the progressiveness of character, the shorter period of duration, the development of cachexia, the greater wasting, the presence of a tumor, a diminution in hydrochloric acid of the gastric juice, or perhaps its absence, and the smaller frequency of hæmatemesis

(the blood presenting the characteristic coffee-grounds appearance). The differentiation from malignant disease of the stomach will have to be based upon the situation of the palpable tumor and its degree of mobility, the frequency and the time of vomiting, and the situation and the time of occurrence of the pain. Gall-stones may occasion symptoms closely resembling those of malignant disease of the duodenum, but they are unattended with cachexia, they differ in course and duration, and the tumor to which they give rise differs in its general physical characteristics from that due to malignant disease of the duodenum. The differentiation from new growths or enlarged glands compressing the duodenum from without depend largely upon the recognition of the conditions to which such processes are usually secondary. Such growths and glands are unattended with the pain, digestive derangement and vomiting so common with malignant disease of the duodenum.

Malignant disease of the large intestine is to be distinguished from fæcal accumulation, peritonitic adhesions, and the presence of foreign bodies in the intestine. All of these are unattended with cachexia and wasting. In cases of fæcal accumulation there is a history of long-standing constipation, with the correction of which any tumor that was present disappears. When peritonitic adhesions are present inquiry may elicit the previous existence of peritonitis. Among foreign bodies occasionally found in the bowel are gall-stones, enteroliths, and possibly detached pedunculated polypoid growths.

Enterolith weighing three hundred and seventy-five grains; length, two and one-fourth inches; circumference, one and one-fourth inches; diameter, one inch, removed from ileum by longitudinal incision. Death occurred the following day

of pulmonary œdema. Perry (Albany Med. Annals, June 20, '88).

Case of large fecal accumulation occurring in a girl, aged 13 years, observed. A rapidly-growing abdominal tumor was not diminished by purgatives, and, as the patient was sinking, an exploratory laparotomy was done. On opening the abdomen the tumor was found to be a fecal mass in the cœcum and colon. Nothing further was done, as the bowels began to act, and in six days the tumor had entirely disappeared. Worrall (Med. Record, June 30, '88).

Case of impaction of the rectum with water-melon seeds, one quart of which were removed by injections. Ricketts (Cincinnati Lancet-Clinic, Sept. 22, '88).

Case showing the diagnostic association between cancer of the colon and floating kidney. A cancer in the middle part of the ascending colon gave rise to dull aching and pains, which the patient almost certainly associated—at first—with his kidney; and as the mass developed the bowel became more and more loaded and distended, the lumbar aching increased on account of pressure upon the psoas and the lumbar nerves. This pressure was especially felt by the genitocurral branch, and the patient complained of pain shooting into the groin and into the region of the cord and testis. Had these symptoms been associated with blood in the urine they might have suggested the presence of a renal calculus, but there was no history of hæmaturia. Edmund Owen (Lancet, Apr. 27, '95).

An inquiry into the history and the progress of the case will soon remove any doubt that may have existed.

Sarcoma of the bowel, likewise, is, in the majority of cases, primary, and it commonly gives rise to metastasis. It extends by contiguity and may thus give rise to the dilatation and rigidity of the wall of the bowel. It also appears at an earlier period in life than malignant disease elsewhere. Constitutional symptoms are likely to develop before local manifestations. The temperature often is elevated. There may be constipation alternating with diarrhœa.

Case of a woman, aged 32, who came under observation with attacks of painful diarrhœa, and a tumor below and to the left of the umbilicus. Laparotomy was performed, and the tumor was then found to involve the jejunum at one metre's distance from the duodenum. The portion of intestine was resected, but the patient died the next day. The growth was twenty centimetres in length, and had sharp margins. The affected part of the gut was enlarged to the size of the transverse colon, its lumen also being increased in size. The mesenteric glands were enlarged. At the operation no other secondary growths were seen. The growth was a small round-celled sarcoma, starting on the submucosa, and had infiltrated all the coats of the bowel. Mermet (Bull. de la Soc. Anat. de Paris, Nov., '96).

Case of myosarcoma of the small intestine in a man, 30 years of age, presenting the following symptoms: Pain in the left flank, constipation followed by diarrhœa, emaciation, and a smooth-surfaced ovoid tumor in the left side of the abdomen, movable and tender. Operation showed a tumor of the small intestine, which was removed by resection of the bowel. The patient was in good health one year after operation. Babès and Nanu (Berliner klin. Woch., No. 7, '97).

The new growth increases in size rapidly, and it may undergo softening at the centre.

The course of the disease is rather rapid, most cases terminating fatally in the course of nine months.

Of benign growths of the bowel adenomata are the most common. They may be flat or polypoid. They are variable in size, although usually small, soft, and bleeding readily. Sometimes they are firm. Their favorite seat is the rectum. They may, however, be numerous and widely distributed. Of other non-malignant growths found in the large bowel may be mentioned fibromata, lipomata, papillomata, myxomata, angiomata, and myomata.

Case of lipoma in the descending colon, which had been felt on examination, was finally passed at stool. It was about the size of one's fist, and was attached to the gut by a pedicle; the pedicle was ligated and the tumor removed by a thermocautery, the patient making a perfect recovery. Link (Wiener med. Woch., Mar. 27, '90).

Remarkable case of tumor of the vermiform appendix, developed in a left inguinal hernial sac containing cæcum. This tumor was of a fatty nature, according to histological examination. In the centre was found the appendicular canal, still permeable; it was, probably, a submucous lipoma. Jossierand (Lyon Méd., Jan. 3, '92).

Case of large fibrolipoma of the descending mesocolon observed. Twelve centimetres of the large intestine were resected in removal of the growth. Death followed from shock. Duret (Jour. des Sci. Méd. de Lille, Apr. 8, '92).

In a man who died at the age of 55 years was found a double row of blackish prominences on the large intestine, containing fecal matter, solid, but not very hard. They were so many diverticula of the intestinal cavity, some in the mesocolon or the mesorectum, others in the pedicle of the epiploic fimbriæ. The first degree of these small herniæ of the mucous membrane was visibly constituted by the normal prominences of the intestine, the largest attaining the size of an ordinary marble. These diverticula began at the colon and from there extended, augmenting in number and volume, to the rectum. Pilliet (Bull. de la Soc. Anat., No. 6, '94).

These growths often give rise to no symptoms. Sometimes the symptoms are indefinite and equivocal. Among the most common manifestations are hæmorrhage, anæmia, diarrhœa, with mucous and blood in the stools and indications of intestinal obstruction.

Treatment.—The treatment of new growths of the intestine is exclusively surgical. Benign neoplasms may de-

mand no interference, even though they may be multiple. Symptoms of obstruction of the bowel would indicate operative intervention. Malignant growths should be removed, if possible, as soon as recognized, providing all of the disease can be excised without compromising life and if metastasis to other organs have not taken place. With the enterectomy may be conjoined some form of intestinal anastomosis, or it may be necessary to establish an artificial anus. The same procedures may be required also for the amelioration of symptoms and, perhaps, the prolongation of life if a radical operation is no longer practicable.

In cases of chronic obstruction there is room for wide difference of opinion as to the advisability of operating. If operation is postponed until obstruction has become complete, or nearly so, operation will only serve to discredit surgery. In cases where operation has been delayed until a palpable tumor can be demonstrated it is probably unjustifiable to resort to even an exploratory operation. There probably is a time, in every case of cancer of the intestine, when the growth is local and can be removed with reasonable probability of a very long period of immunity. It is therefore important that the early symptoms of intestinal cancer should be more carefully studied and better understood. Exploratory incision should be restricted to those cases in which the earliest symptoms are those of acute intestinal obstruction, acute or chronic appendicitis, or of chronic intestinal disturbance in cases in which the presence of malignant disease is strongly suspected. Exploratory incision should be followed by radical operation only in those cases in which the disease, so far as gross examination will enable one to judge, can be wholly isolated and removed. Palliative operations are rarely justified. Homer Gage (Boston Medical and Surgical Journal, Sept. 10, 1903).

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INTUBATION OF THE LARYNX.—

Few operations in the history of medicine have excited more wide-spread interest than intubation of the larynx. It has fulfilled the expectations of its advocates, and has fairly and surely won its way in favor, until it now outranks the older and time-honored operation of tracheotomy. We are indebted to Dr. Bouchut, of Paris, for the idea of relieving stenosis of the larynx by a tube intro-

(Fig. 1), and Dr. O'Dwyer's early experiments and the gradual development of the instruments (Figs. 2, 3, 4, 5, 6, and 7), are all a matter of history which has been fully recorded in medical literature.

Intubation of the larynx is a difficult operation; indeed, by many it is regarded as one of the most difficult in surgery. It certainly requires the maximum amount of manual dexterity if it is to be performed with gentleness and celerity.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Gradual development of intubation instruments.

duced by way of the mouth, but to the late Dr. Joseph O'Dwyer, of New York City, belongs the imperishable honor of reviving the operation from buried forgetfulness, and by his ingenuity of so modifying the instruments as to make them of practical utility.

The relief of laryngeal stenosis by means of catheters introduced into the trachea through the larynx, the use of the short round tube as used by Bouchut

One cannot become expert without considerable practical experience.

Theoretical knowledge is important, but I would emphasize the necessity of a thorough and careful training by practice upon the cadaver. Unless the operation is quickly and skillfully done, it becomes one of the most repulsive and brutal in surgery. This difficult technique has doubtless had much to do with the opposition it has met in the past.

Indications.—In considering the subject of intubation, one of the first questions raised will be as to the diseases or conditions calling for the operation. Are all cases of alarming dyspnoea to be treated by intubation? Most decidedly not. In case of foreign bodies so imbedded in the larynx as to produce difficult respiration the performance of intubation would obviously be a fatal mistake. In cases of pharyngeal abscess located low down, causing more or less difficulty in breathing, or the presence of retro-oesophageal abscess, had better, for obvious reasons, be treated otherwise. In many cases there is marked dyspnoea from great enlargement of the tonsils and uvula, associated with nasal obstruction, with little or no involvement of the larynx. Intubation would be useless and uncalled for in these cases. Oedema of the larynx may give rise to great and even fatal dyspnoea. The majority of such cases, I am convinced, are better treated by tracheotomy. In most of these cases the swelling of the arytenoid cartilages and of the epiglottis is so great that the head of the tube in the larynx is overlapped; hence little relief is experienced. The larynx here requires rest, which it cannot obtain with a large heavy tube *in situ*.

[No form of acute stenosis of the larynx, when situated in or above the chink of the glottis, ever offers any very serious impediments to passage of a tube of the proper size. The infiltration of the mucous membrane, which is the principal cause of the obstruction in croup, is rarely, if ever, confined to these parts, but extends to the subglottic division of the larynx; and, this being small in the normal condition, any considerable swelling of the tissues reduces the breathing space, in some cases, to a mere pin-hole. JOSEPH O'DWYER, Assoc. Ed., Annual, '92.]

Two cases noted in which it was impossible to introduce the laryngeal tube,

owing to smallness of the glottis, due to oedema. Ganghofner (Jahrb. f. Kinderh. u. phys. Erzieh., Nov. 30, '89).

Intubation with permanent relief of dyspnoea in case of subglottic oedema, using a No. 6 tube. Chiari (La Méd. Mod., Nov. 14, '94).

[No. 6 tube, the largest of children's tubes, not safe in adults, even immediately after the age of puberty, without a strong string attached. J. O'DWYER, Assoc. Ed., Annual, '96.]

Intubation is indicated in every instance in which dyspnoea is caused by



Fig. 8.—Pin-head respiratory passage due to swelling, as an obstruction to the introduction of a tube.

laryngeal obstruction, except when due to lodgment of a foreign body in such a manner that the introduction of a tube is mechanically impossible. Bernard Wolff (Laryngoscope, Nov., '98).

Intubation in ulceration of the cricoid region. If in a stenosis of the larynx due to an acute infection, intubation should become necessary, it does not follow that it need be repeated, especially if there be ulceration of the cricoid mucous membrane, and more particularly if we suspect perichondritis and caries of the cartilage; in such a case it is more reasonable to follow up the intubation by a tracheotomy done with the fullest preparation. Such ulcerations and inflammations are shown by spontaneous rejection of the tube, by mucopurulent and blood-stained expectoration after each rejection of the tube

and after its insertion, and by difficulty of keeping it in the larynx in spite of the utmost care in selecting a tube of suitable pattern and size. Tommasi (*Arch. Ital. di Otol., Rinol., e Laringol.*, Nov., 1903).

When we are called to a case of suffocation, before hastily resorting to intubation we should make a correct diagnosis and exclude the cases in which this operation is clearly indicated. This matter of differential diagnosis is most important, and a patient's life may depend quite as much upon the diagnostic skill of the physician as upon his ability to do the operation when indicated. The special field and usefulness of intubation is in cases of diphtheritic or membranous obstruction of the larynx; the presence of growths in children, as papilloma; and cicatricial stenosis in the adult.

Intubation recommended in certain cases of laryngeal stenosis from chronic inflammation or from accidental or surgical conditions. Thomas Annandale (*Brit. Med. Jour.*, Mar. 2, '89).

Intubation in syphilitic stenosis affords, in a large proportion of cases, the simplest and most practical means devised of quickly and efficiently relieving the dyspnoea of acute laryngeal stenosis, and for dilating chronic cicatricial stricture with speed and certainty. Lefferts (*Med. Record*, Oct. 4, '90).

[In cicatricial stricture of the larynx, after thorough dilatation has been accomplished, intermittent intubation, extending over a considerable period of time, will be required in order to effect a cure. First personal case was of this nature, and required occasional dilatation for three years to accomplish a permanent cure. The intervals between the intubation were at first one week, which was finally extended to two months, the tube being left in position from one to three days on each occasion.

The significance attached to the results obtained in a small number of cases of chronic stenosis of the larynx treated by intubation is very different from that to be derived from an equal number of

cases of croup, because in the former there are none of the complications that exist in the latter. It matters not how badly the patients swallow, no pulmonary complications ever occur, or, at least, ever have occurred in my experience. JOSEPH O'DWYER, *Assoc. Ed.*, *Annual*, '92.]

All cases of chronic stenosis requiring intubation are divided into two classes: (1) those in which the operation is practiced for the double purpose of relieving existing dyspnoea and at the same time producing gradual dilatation of the stricture; (2) those in which it is resorted to in order to get rid of retained tracheal cannulae. O'Dwyer (*Jour. of Laryng.*, Oct., '94).

Case of laryngeal stenosis in which tracheotomy was first performed; stricture then dilated with sounds from below until small tube could be introduced from above. Tracheal wound allowed to close and large tubes introduced into larynx. Cholmeley (*Birmingham Med. Rev.*, May, '95).

[This procedure recommended in former editions of *Annual*. Very slight enlargement of tracheal wound only necessary. From above, the tube may enter one of the ventricles and create false passage. JOSEPH O'DWYER, *Assoc. Ed.*, *Annual*, '96.]

Intubation in infant in whom nut-shell had entered larynx. Complete relief. Bonain (*Revue Mens. des Mal. de l'Enfance*, July, '95).

It is unnecessary in this connection to review the literature of intubation in cases of papilloma in children or of cicatricial stenosis in the adult. It is a legitimate and often successful procedure in both conditions.

Intubation in Diphtheria.—In the great majority of cases the operation will be called for to relieve the impending suffocation in diphtheritic or so-called membranous croup.

In cases of diphtheritic or membranous stenosis of the larynx, which conditions I believe to be identical with perhaps a very few exceptions, it often

becomes a nice question of judgment as to when we should interfere surgically. Shall we operate early with the first symptoms of laryngeal invasion or wait until it is evident the patient must die unless given relief? I would say that if we operate early we will do so in many, in these days of antitoxin, that would recover without operation; on the other hand, if we operate late, after the patient has become comatose, and unconscious, we will lose cases that would recover otherwise. It does not often happen that the operation is done early, as it is generally performed by the specialist, who is only called in as a last resort. I believe it can be safely said that the operation is more frequently performed too late to give the best chances of recovery than too early. Inasmuch as, properly carried out, the operation in no wise compromises the case or adds to its danger, but gives comfort, relieves suffering, and prevents exhaustion, there seems to be no valid reason why the operation should be postponed after certain well-marked symptoms have occurred.

There are signals of danger and distress which should never be passed unheeded and which, once recognized, render the operation imperative. When the voice becomes toneless, and whispering and the cough suppressed; when, in addition, the dyspnoea becomes urgent, and the loud stridor of croup is heard both during inspiration and expiration; when there is marked recession at the base of the sternum and above the clavicles; and when all these symptoms cannot be relieved by emetics, it is certainly time to operate.

While we are not justified in waiting longer after these symptoms have appeared, it is even better when possible to operate earlier. When the diagnosis of diphtheritic or membranous laryngitis is

clear and positive, as indicated by the voice and cough, beginning dyspnoea, the bacteriological examination, and the gradually increasing distress, in spite of treatment, I believe we should not wait until the condition becomes alarming. Again, in infants, and in young and feeble subjects, the dyspnoea, while not sufficient to give rise to marked cyanosis or alarming symptoms of suffocation, may, nevertheless, be sufficient to cause dangerous or even fatal exhaustion. In these cases it is our plain duty to operate earlier than when the patients are older, more rugged, and better able to stand the exhaustion caused by difficult respiration.

In all cases of intended intubation the surgeon should have instruments ready at hand for tracheotomy, and should not only have the consent of the parents for intubation, but for tracheotomy, also, if the latter should become necessary. Bays (*Lancet*, Sept. 20, '90).

Intubation should be practiced in all cases presenting any one of the following symptoms prominently: Deep epigastric recession with each inspiration, labored and prolonged expiration, extreme restlessness, spasmodic attacks coming on at intervals, or persistent cyanosis. In cases seen late it might be wiser to intubate and administer antitoxin rather than administer antitoxin and wait for its effects before intubation. H. M. McClanahan (*Brit. Med. Jour.*, July 9, '98).

Serum-therapy has greatly diminished the percentage of operations in laryngeal diphtheria, as antitoxin causes the most serious symptoms of stenosis to rapidly disappear; the main use of intubation now is to assist in tiding the patient over momentary danger. Collective investigation to ascertain the extent to which intubation has been employed in private practice, and the results obtained. Answers received from 84 European and American physicians, 55 of whom have altogether performed 5468 intubations in private, with an average of recoveries of 35.6 per cent., before serotherapy was

adopted and of 81.98 per cent. since. Accidents after intubation shown to be by no means so common as believed, and as might be theoretically expected. Trumpp (*Münchener med. Woch.*, No. 44, '99).

Technique.—**PRELIMINARY PRACTICE.**

—Preliminary practice upon the adult cadaver is of but little help in acquiring

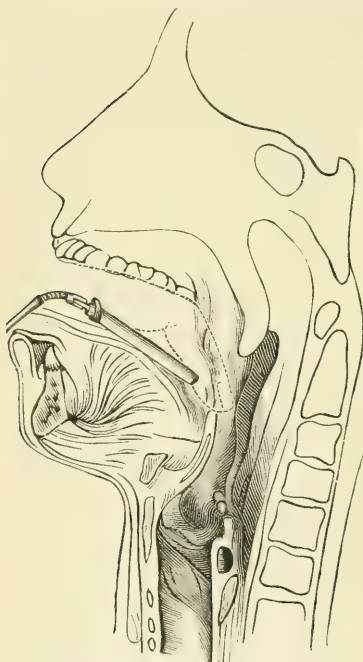


Fig. 9.—Course of the tube from the mouth to the laryngeal cavity.

the operative technique for children. The adult larynx, in the cadaver, is almost beyond the reach of the finger; the epiglottis is prominent, while the cavity of the larynx is large and easily determined. In young children, however, the epiglottis is small; while the rima glottidis feels to the touch as a mere slit or

depression. By referring to Fig. 9 it will be seen that if the epiglottis is drawn forward with the finger and the tube is passed in the median line with its point hugging the anterior wall, it must necessarily pass into the larynx. It is important to follow precisely the median line and to hug the anterior wall with the point of the tube.

Many operators prefer to perform the operation in the adult by the aid of the laryngeal mirror. The patient holds the tongue (with a napkin or soft towel between the thumb and forefinger of the right hand) well drawn out, while the operator, sitting in front and aided by reflected light from a mirror on the forehead and by the laryngeal mirror, guides the tube over the epiglottis and engages its point in the cavity of the larynx. Quickly dropping the laryngeal mirror from the left hand he then passes the forefinger down upon the head of the tube and crowds it into position. One accustomed to laryngeal work will perform the operation in this manner very readily, but the procedure is practically impossible for one not familiar with laryngeal instruments and their use.

[In chronic cases, in which the throat has become more or less accustomed to the use of instruments, intubation can be performed with greater facility and with less discomfort to the patient by the aid of the mirror than by the usual method. JOSEPH O'DWYER, Assoc. Ed., *Annual*, '92.]

Intubation in children by this method is impracticable. The patient must be properly held before a good light. The base of the tongue is held down with a tongue-depressor, and, as the epiglottis rises to view, the point of the tube is directed into the larynx, passing immediately behind the epiglottis. The tube is then pressed down into position with the forefinger of the left hand as the tube is

released from its introducer. As soon as the point of the tube passes over the epiglottis, the hand holding the introducer must be quickly elevated, keeping the point of the tube stationary until the turn is made, in order that the tube may pass down at an acute angle. Otherwise the tube will invariably slide over into the œsophagus. The annexed cut shows how such a misdirection can be given the tube. This method, however, is not to be preferred; but it may be employed by those who do not possess or who cannot acquire the manual dexterity to perform the operation with the assistance of the tactile sense alone: *i.e.*, unaided by the eye.

The ideal operation should be conducted through the sense of touch entirely. One should handle the instruments frequently; the sliding spring of the introducer, shown in the cut, should be moved by the thumb and not by the forefinger. The extractor should be held in the manner indicated by the second figure. By frequently introducing the tube into the closed hand of another person, holding the introducer in the right hand, detaching the tube and pressing it down with the forefinger of the left hand in the exact manner as when introduced into the larynx, slight practical experience can be gained. One should become so familiar with the instruments that the various steps of the operation can be carried out, so to say, automatically.

As the extraction of the tube is even more difficult than its introduction, it is important also to practice extracting it from the closed hand of another. Introducing and extracting the tube from the larynx of a small dog under an anæsthetic will frequently be of great help in acquiring dexterity.

The instruments should be held lightly. Little or no force should be

used, no anæsthetic is necessary, and the operation should not require longer than from five to ten seconds. It occasionally happens that when the end of the tube reaches the larynx, and before it becomes engaged, spasm of the larynx occurs. In such a case it is best, instead of using

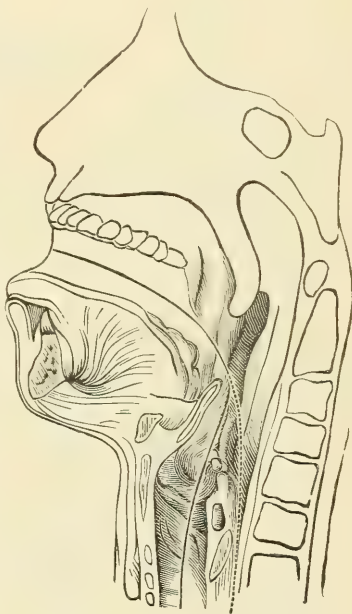


Fig. 10.

force, to simply wait a few seconds, holding the tube in position. The patient will then endeavor to breathe, the spasm will relax, and the tube will drop into position.

Greatest care recommended in introduction to avoid laceration of the tissues; the tube should be removed every three days to avoid irritation from the calcareous deposits. If a tube is introduced

more than twice, it is of advantage to use a rubber tube, immersing it in a solution of hot gelatin, containing 5 to 10 per cent. of powdered alum; a 10-per-cent. solution of ichthyol and gelatin is also a valuable preparation. An imperfectly constructed tube or one which does not

and should be placed upon the table within easy reach. The patient should be held upright in the lap of the nurse supported closely against the left chest with the head resting on the shoulder. The nurse should sit upright in a

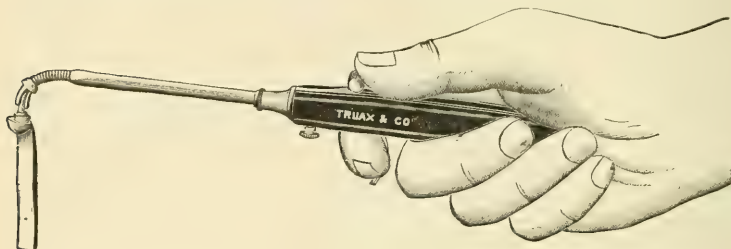


Fig. 11.

properly fit the larynx may tend to injury followed by stenosis. Fischer (Med. Record, Dec. 2, '99).

In performing the operation the physician should first select a tube appropriate for the age of the patient, as indicated by a scale that accompanies every set of instruments. The tube should then be threaded with silk or linen

straight-backed chair and the patient be held firmly and not be allowed to slide down. The forearms of the child should be crossed in front and the nurse should grasp the wrists, the left wrist with the right hand and the right wrist with her left hand. The gag is then introduced in the left angle of the mouth well

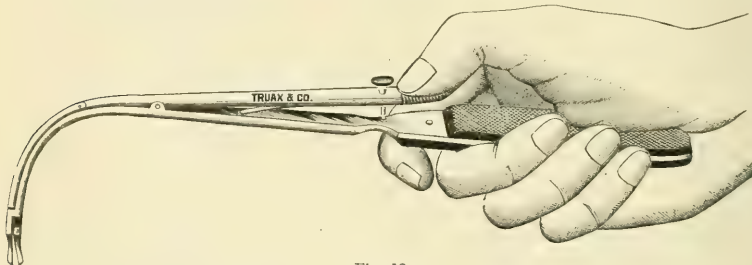


Fig. 12.

thread, making a loop about fourteen inches in length. The obturator fitting the tube to be used (Fig. 7) should then be screwed upon the introducer if the O'Dwyer instruments are used, and the tube attached. It is now ready for use,

back between the teeth and widely opened (Fig. 13). The operator standing in front then quickly seizes the introducer with tube attached, hooks the loop or bridle over the little finger of the left hand, and introduces the index finger of

the same hand closely followed by the tube (Fig. 14). He raises the epiglottis forward with the index finger (Fig. 9) and guides the end of the tube gently over it when, by making an abrupt turn, he will pass the tube into the larynx if he has been careful to keep in the median line; or he may pass the index finger over the epiglottis and upon the arytenoid cartilages and guide the end of the tube into the larynx.

My method is to feel for the small opening or depression just back of the epiglottis with the finger and guide the end of the tube into it. In any case the end of the tube should pass under the tip of the finger, not over it or by the side of it, but directly under it. The moment the end of the tube engages the larynx the right hand, holding the introducer, should be quickly elevated allowing the tube to pass down at right angle. Simultaneously the tube is loosened from the introducer by pressing forward the slide with the thumb. The index finger of the left hand, which has acted as guide, is placed upon the head of the tube and gently presses it down into position as the introducer is removed. It is important to bear in mind the necessity of hugging the anterior wall with the end of the tube as it is introduced. In order to do this, it should follow a gentle curve, until it has passed over the epiglottis, and remain stationary for an instant as far as downward progress is concerned, while the handle is quickly elevated. The dark line in Fig. 15 represents the curve that should be followed by the end of the tube while it is being introduced. This sudden turn constitutes one of the salient points of the operation, for if the curve be continued as indicated by the dotted line, the tube will invariably pass into the œsophagus.

A prolonged attempt at introducing

the tube should be avoided. Many brief trials characterized by gentleness will do much less harm. If during the first attempt the tube passes into the œsophagus, the instrument and the finger should be removed from the throat, and the patient be allowed to recover his breath for



Fig. 13.

a moment. A new trial is then made. Entrance of the tube into the larynx is indicated by violent coughing and by easy respiration, if the tube is not blocked by membrane below it.

To ascertain whether the tube is in position the child, sitting upright, is al-

lowed to drink a small quantity of water from a glass; if the tube is in the larynx violent coughing will result. If it is in the œsophagus there will be no violent coughing, no relief from the threatening suffocation, and there will also be a gradual shortening of the loop as the tube gravitates toward the stomach.

newed. The operator should wait a few minutes to make sure that the tube is in position, and to allow the cough to expel the mucus and softened membrane. He should then replace the gag, cut the loop near the mouth and introduce the index finger of the left hand until it reaches the head of the tube. This is held down



Fig. 14.

If the operator is quite certain that the tube has entered the larynx the gag should be removed and the loop placed backward over the ear. While doing this, the hands of the patient should be held firmly by the nurse, otherwise the child will grasp the thread, pull out the tube, and the procedure will have to be re-

while the thread is removed by pulling on one end of the loop.

The string should be permitted to remain in place, being passed over the left ear, until quiet breathing is restored, from fifteen minutes to half an hour, and should then be removed by cutting one side of the loop close to the mouth, taking hold of the long end, and with-

drawing while the left forefinger is making gentle pressure down on the head of the tube. Never, under any circumstances, should the string be removed without making pressure on the head of the tube, as the string becomes twisted in the mouth and will be caught in the eyelet of the tube and the latter itself withdrawn unless the counter-pressure is made. Another very important precaution is that the person holding the child should never release the child's hands until the string is removed by the surgeon. W. K. Simpson (Med. News, Mar. 19, '98).

If, in introducing the tube, membrane is crowded down ahead of it and respiration is difficult or impossible, as a consequence, the patient should be encouraged to cough violently. As he does this the tube should be quickly jerked by means of the thread still attached. Frequently a large mass of membrane will be expelled. If this does not occur stimulants and water should be given and violent coughing encouraged.

It will occasionally happen that in spite of all efforts a patient is unable to expel the offending and obstructing membrane. In such a case it is necessary to employ a long pair of tracheal forceps and, as the child coughs, endeavor to grasp the membrane and remove it. If still unsuccessful our last resort is to perform tracheotomy and extract the membrane. This, however, is rarely necessary.

Out of two hundred cases in only two has the membrane been crowded down sufficiently to produce asphyxiation, and in both of these it was immediately coughed out on removal of the tube. O'Dwyer (Med. News, June 23, '88).

Pushing down of the pseudomembrane by intubation is seldom observed, and only in rare cases ends fatally. The asphyxia caused by it can be relieved by extubation, and the loosened membrane will be expectorated. If no expectoration follows extubation, artificial respiration must be performed, and, if

this has no effect, tracheotomy should be performed. The later obstruction of the tube by pseudomembrane rarely occurs. The thread should be fixed to the child's neck, so that extubation could be performed by the nurse if necessary. Bokay (Pester med.-chir. Presse, No. 12, '94).

Of 498 intubation cases, an immediate tracheotomy became necessary in $3\frac{1}{2}$ per cent. on account of detachment of pseudomembrane. Tracheotomy failed to relieve the asphyxia in only 2 of these cases, and these patients died from the pushing down of pseudomembrane. Immediate extubation leads, in most cases, to the result that the loosened pseudomembrane is ejected by violent coughing, either simultaneously with the

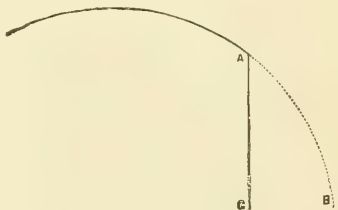


Fig. 15.

tube or directly after it. Johann v. Bokay, translated by Edward M. Plummer (Annals of Gyn. and Pediatrics, Jan., '99).

After the tube has been successfully introduced the patient experiences entire relief. The change in the appearance of the patient is not only immediate, but remarkable.

The loud stridor, sometimes heard all over the house, the projecting eyeballs, the livid features, the cyanosis, the clutching at the throat, the piteous begging in a whispering voice for help, cease as if by magic. The patient lies pale and quiet. The loud stridor is replaced by almost noiseless respiration, and death is held at bay. The patient falls into quiet refreshing slumber.

After-treatment of Intubated Cases.—

Rest and nutrition are now important. In former days the question of feeding was beset with many difficulties, but now happily these obstacles have been largely overcome. It was found by Drs. Frank Carey and William E. Casselberry, of Chicago, while jointly treating a case, that if the patient were placed in the recumbent position, with the head slightly lower than the shoulders, swallowing could be effected with little difficulty. This discovery marked a great advance in the successful management of these cases, and has added not a little to the success of the operation and to the comfort of the little sufferers.

In order to obviate the difficulties of administering liquids to patients who have undergone intubation, the child should be placed head downward on an inclined plane; an angle of from 45 to 90 degrees seems necessary to obtain the best results. The child is held on its back in the arms of the nurse, the feet elevated, and the head left to hang over the arm, then it may take the mouth of the feeding-bottle, suck through a tube from a glass, or feed from a spoon. The only difficulty is encountered when the child is again placed in the upright position, which posture it must not be permitted to regain until it has been made to swallow three or four times after the vessel of liquid has been taken from its mouth, in order to swallow all the fluid which has gravitated into the pharynx and naso-pharynx. Casselberry (*Chicago Med. Jour. and Examiner*, Oct., '88).

The mechanism is simple enough: the tube being on an incline, the fluid cannot drop into it. The patient should be placed on a pillow with the head extending slightly over it, either on the back or the side, preferably the side; the pillow is moved over the side of the bed and the head is slightly depressed. If the head is lowered too much the fluid will pass into the post-nasal space and nasal cavities, while if it is raised too much

it will pass through the tube and into the lungs and cause violent coughing. A few trials will demonstrate the required position in each individual case. With a little patience and firmness a child should take abundance of liquid nourishment without difficulty. The physician should himself attend personally to this matter until the attendants are so trained that they are fully capable.

In feeding children, while the tube is in the larynx, the writer prefers to have the patient lie on the stomach, face down, as this gives greater command over the constrictors. Thomas J. Hillis (*N. Y. Med. Jour.*, Dec. 5, '96).

It is best to give water and food from a spoon, although some children will prefer to draw it through a glass or rubber tube. The nourishment should be milk, beef-juice, or the various soups, although semisolids—as custards, ice-cream, and the like—may be allowed in case there is repugnance for the more fluid foods. Milk is the most convenient, and usually the best food that can be given in these cases.

Regarding the after-treatment, little need be said. Antitoxin should have been given at the very onset of the disease and should have been repeated. If not, it should now be given in large dosage and again repeated in twelve or sixteen hours. If there is a tendency of the membrane to extend downward, indicated by quickened respiration and sometimes by râles or roughened or harsh respiratory sounds, then the antitoxin should be crowded to the limit.

Report of twenty-nine cases of intubation with the combined use of antitoxin. All the cases were seen in consultation, and in all of them the operation was urgently required. Three were under two years of age, with two recoveries, or 66 2/3 per cent.; eight were two years old, with eight recoveries, or 100 per cent.; six were three years old, with six recoveries, or 100 per cent.; six were

four years old, with five recoveries, or 83 1/2 per cent.; two were five years old, with two recoveries, or 100 per cent.; and four were six years old, with four recoveries, or 100 per cent. Total, twenty-nine cases with twenty-seven recoveries, or 93.1 per cent., a mortality of only 6.9 per cent. This great reduction in the mortality is attributed to the full and free use of antitoxin in all the cases. Waxham (*Archives of Ped.*, Mar., '98).

If the case is not one of mixed infection all sprays and douches and applications to the throat can be abandoned. In case of mixed infection if there is much offensive discharge from the nose and throat a simple non-irritating antiseptic solution should be gently used in the nasal cavities with the douche or syringe and in the throat by means of the spray; at the same time giving antitoxin and supporting the patient by stimulants and nourishment. How long should the tube be allowed to remain in the larynx? This will depend upon circumstances entirely. If there is a considerable amount of membrane in the trachea it must necessarily come away; sometimes it softens down and is expelled through the tube in the form of muco-pus without difficulty, but not infrequently large flakes or patches become loosened and endanger the life of the patient by obstructing the tube. If a too tightly fitting tube has not been used it will frequently be expelled on the second or third day on account of obstructing membrane below it and commonly it will not be necessary to replace it. It is always to be feared, however, that the tube may not be expelled when it becomes obstructed. Whenever there is evidence of partially detached membrane below the tube, indicated by a flapping sound, a peculiar hoarseness of the cough, or by sudden and evident closure of tube during an expulsive cough we should at once extract the tube whether it has been in one day

or three days or four days, or else remain constantly with the patient in order to extract the tube in case total obstruction occurs and the patient is unable to expel it.

In cases where antitoxin has been used it is advisable to extubate after thirty-six or forty-eight hours. This is the

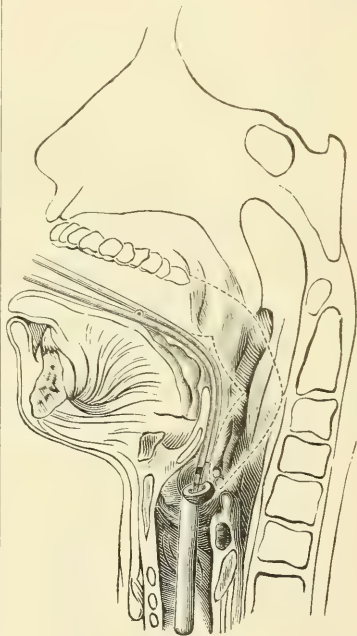


Fig. 16.

time when, by the action of the antitoxin, the membrane is being thrown off. It may be necessary to reintubate. J. C. Connell (*Brit. Med. Jour.*, June 5, '97).

The principal indications for removing the tube previous to its final removal are severe discomfort or pain from pressure, especially if the pain be radiating in character, severe attacks of coughing, and sudden stenosis due to the lodgment

of membrane in the lumen of the tube.
W. K. Simpson (Med. News, Mar. 19,
'98).

Obstruction of Tube.—The attendants should be instructed in case of emergency if obstruction occurs suddenly to hold the child with the head down shaking him, while another suddenly and sharply strikes the patient a smart blow upon the chest and back.

Syncope caused by intubation of the glottis should be treated by repeated blows upon the back and præcordial region, the child being held with the head downward. Poulet (Bull. Gén. de Thérap., Nov. 8, '96).

In case total obstruction occurs the child will die in a few moments unless the tube can be expelled. Happily these emergencies do not frequently occur. If everything goes smoothly and the patient is taking nourishment well and there has occurred no evidences of obstruction it is my custom to remove the tube on the fourth or fifth day. It will very seldom happen that the tube will be necessary for a longer time, providing the operation has been skillfully performed and no damage has been done to the larynx. The shorter time the tube is worn the less likely are we to meet with paralysis of the vocal cords and other conditions that often require its long continued use.

In extracting the tube the patient should be placed in the same position as when it is introduced. The gag should be placed as before and the index finger of the left hand introduced until it reaches the head of the tube. The extractor, held in the right hand, should quickly follow the finger, the point of which should be guided into the tube. (Fig. 16.) By pressing on the lever above the handle the jaws of the instrument are separated, thus holding the tube securely while it is removed.

In a case where attempts at extraction caused a small tube to sink farther down into the larynx, pressure made with the thumb on the trachea, just below the cricoid cartilage, where the end of the tube could be felt, caused cough, which forced the tube out. This method of expression never failed in subsequent cases. The pressure may be made with both thumbs inward and directly upward. If a more powerful pressure is exerted the tube may be forced entirely out of the mouth. Trumpp (Münch. med. Woch., Apr. 28, '96).

While it is the rule that the tube is no longer necessary after the fourth or fifth day and frequently not after the second or third, yet it sometimes occurs that it cannot be dispensed with for two, three, or six weeks, or even longer. After its removal the dyspnœa returns, sometimes immediately, and sometimes after a few hours, occasionally after one or two days have passed.

It is always well to remain with the patient an hour after the removal of the tube or be within ready call in order to replace the tube in case of emergency. Cases of sudden death have occurred from returning dyspnœa after the operation has left the patient in fancied security. As a rule, the dyspnœa returns slowly; so that it is several hours before the patient is in an alarming condition. Occasionally it returns suddenly and almost immediately after the removal of the tube.

Prolonged Use of Tube.—A number of causes have been enumerated as rendering necessary the long-continued use of the tube. Principal among them may be mentioned the formation of diphtheritic exudate or its long persistence in the larynx and trachea; œdema of the tissues; ulceration of the cricoid cartilage and consequent collapse of the thyroid cartilage; cicatricial contrac-

tions and exuberant granulations following ulcerations and abduction paralysis.

Pressure-sores produced by the prolonged contact of the tube with the air-passage were found in post-mortem examination in 156 cases, or 13 per cent. of the 1203 submitted to intubation in the Children's Hospital at Budapest. Sixteen out of the 499 cases which recovered showed symptoms of pressure-sores, and were therefore subjected to secondary tracheotomy. The sores were located on the anterior wall, and in order of frequency in the trachea, thyroid, and cricoid cartilages. They varied in depth from superficial ulcers to those exposing the cartilages and attended with perforation. Coughing and blood-stained expectoration. The severe cases are apt to result in cicatricial stenosis of the larynx. V. Bokay (Centralb. f. Chir., May 11, 1901).

In some of these the lesions are due to a too tightly fitting tube, to leaving the tube in too long, to poorly-constructed instruments, and some to injuries resulting from unskillful operations.

With the use of antitoxin, which enables the patient to dispense with the tube at an earlier day, and greater skill acquired in performing the operation, these conditions will less frequently arise.

An important point to emphasize is that when the operator appreciates the fact that a tube is too large, as indicated by the force required to press it down into position, he should at once remove it and use a smaller one. The unduly large one will not only cause ulceration or paralysis from undue pressure, but, in case of obstruction below the tube, also give rise to exfoliation of membrane. There will, furthermore, be great danger of sudden suffocation from the inability of the patient to expel the tube.

Erosion of the mucous membrane and exposure of the cartilages observed at the autopsy in 4 of 42 cases. Ganghofner (Jahrb. f. Kinderh. u. phys. Erzieh., Nov. 30, '90).

Case of sudden death, on reinsertion of tube, from tracheal cast pushed down by tube, after removal on seventh day. Evans (Archives of Pediatrics, Mar., '95).

[Death, in such cases, may be due to (1) asphyxia; (2) pushing down of membrane; (3) making false passage, beginning in ventricle. The latter is more liable to occur, at the end of the week, on reintroduction, through previous obliteration of the ventricle by pseudomembrane, etc. Practice in cadaver, where the ventricles are avoided with difficulty, is recommended. It can only occur when the patient's head is thrown too far back, bringing the lower end of the tube against the anterior laryngeal wall. JOSEPH O'DWYER, Assoc. Ed., Annual, '96.]

Decreasing length of tube a means of obviating obstruction accidents. Bayeux (La Méd. Moderne, May 25, '95).

[Length is as important as breadth, thickness, or calibre. The present length was adopted, not after experiments on cadaver, but on the living, steps being suggested by post-mortem findings. Diphtheria is rarely confined to the larynx when the time for intubation or tracheotomy is reached. Tracheal detached membrane is the greatest danger of intubation; the expiration is suddenly arrested by closure of lower end of tube. Hence the length of the latter. Bayeux's claim for short tubes is theoretical, except in statement that they can be expelled by pressure from outside: a method frequently employed in the United States. Cheatham claims to have been first in its adoption. JOSEPH O'DWYER, Assoc. Ed., Annual, '96.]

Case in which use of catgut led to fatal asphyxia and to belief that tube had fallen into trachea, the catgut having absorbed moisture and appearing as soft tissue to finger. Delvincourt (Union Méd. du Nord-est, June 30, '95).

[This is sufficient to produce fatal apnea, a silk thread having produced serious obstruction. In performing tracheotomy after intubation, it is important to remember that, unless the cricoid cartilage be cut, it is impossible to pull tube downward. It must be pushed upward with small forceps or by lateral

external pressure. JOSEPH O'DWYER, Assoc. Ed., Annual, '96.]

Death a few minutes after intubation in case treated with antitoxin. Supposed to be due to bulbar reflex. Duran (Amer. Jour. Med. Sciences, June, '95).

[Convulsions are usually due to partial asphyxia from prolonged attempts to intubate, and to uræmia. Illustrative case, in which high temperature (107° F.) was found to be cause of convulsions. JOSEPH O'DWYER, Assoc. Ed., Annual, '96.]

Accidental swallowing of tube in 4 cases out of 122. Two of the children passed the tubes,—1 in two days, the other in three days. The other 2 died from disease; one tube found in the stomach, the other in the cæcum. Variot (L'Union Méd., July 13, '95).

[If properly placed and string removed, unusually large percentage of accidents. In only 2 out of almost 500 personal cases were tubes coughed out or swallowed. JOSEPH O'DWYER, Assoc. Ed., Annual, '96.]

Prolonged intubation and consecutive ulceration of trachea and mediastinal abscess. Meslay (Jour. de Méd. de Bordeaux, July, '95).

O'Dwyer's tube seems occasionally to be productive of laryngeal stenosis. The majority of cases of stenosis occurred in children who had expelled the tube frequently during the treatment of their laryngeal or other trouble. Some of these stenoses were seated below the glottis; others, and they were the gravest, were situated at the level of the cricoid cartilage, where the larynx is narrowest. Repeated expulsions of the tube are symptomatic of laryngeal ulceration of the cricoid region of the larynx. This region should serve as the gauge for the size of the tube to be used, which would vary according to the child's age. Bokai, Heubner, Boulay, Sévestre (Twelfth Inter. Congress of Surgery; N. Y. Med. Jour., Oct. 16, '97).

Importance demonstrated on regulating the size of the tube in accordance with the glove, and not the age, of the child. Glover (Jour. of L., R., and O., Mar., '98).

Case in which intubation was prolonged to one hundred and thirty-six days. The

tube may be left for a long time in the larynx without harm, provided that it is of the proper size and material and that the surgeon bear in mind the delicacy of the structures upon which he is working. Ichthyol is an excellent agent as antiseptic in cases of intubation. D. Tanturri (Gior. Inter. delle Scienza Med., June 30, 1900).

In case there is long-continued necessity for the use of the tube, what can be done? After removing the tube on the fourth or fifth day, if the dyspnoea returns, a smaller tube should be introduced instead of the one removed. This in turn should not remain longer than two days without being removed, providing it has not been previously expelled. If the dyspnoea still returns, introduce a still smaller tube. The effort should now be to use the smallest tube that will be retained. This method, together with the free administration of strychnine, offers the greatest hope of promptly overcoming the difficulty.

It should be a rule of practice to remove the tube within five days after the operation unless it be removed by expectoration before, and then be no longer required. All cases requiring a tube for a longer period than five days should receive large doses of strychnine and constant reintubation and extubation daily or every second day, and progressively smaller tubes should be used. E. Rosenthal (Amer. Med., May 4, 1901).

Modifications of O'Dwyer's Instruments.—The instruments as fully perfected by Dr. O'Dwyer have been modified by various operators; some of these modifications are questionable improvements, while some undoubtedly possess advantages. The main idea, however, remains unchanged; and, however, greatly the instruments may be altered, the fame of the great and original inventor will never be dimmed. In this connection reference will be made to only a few of these modifications.

The writer, in the early history of the operation finding the original gag (Fig. 17) inconvenient on account of its strik-

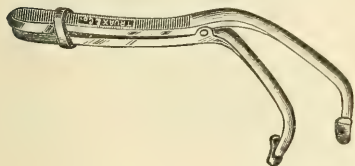


Fig. 17.

ing the shoulder, had one constructed (Fig. 18) to extend backward instead of downward, thus overcoming this objec-

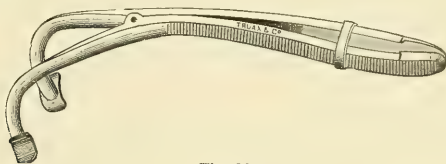


Fig. 18.

tion. This gag answers well all requirements. The gag has also been modified by others, notably by Henrotin (Fig. 19) and Allingham (Fig. 20). An ingenious method of overcoming the difficulty of extracting the tube was devised by Dr. Dillon Brown, of New York. It consists of a tube, with small ring attached to the head, and a thimble, with hook attached, which he used on the index finger of the right hand. Having never used this method, I cannot speak of its merits. Another modification has been devised by Ferroud, aiming to make one instrument answer for both extractor and introducer; his instruments have been still further modified and simplified.

Modification of usual instruments so as to make one instrument serve for introduction and extraction of tubes, extractor having much shorter curve. Egidi (*Il Policlinico*, vol. i, No. 35, '95).

[A single instrument cannot be constructed to satisfactorily serve both purposes. If tubes are long, the curve of the introducer must be short, else the difficulty of entering the larynx is increased; tubes cannot be removed with short-curved extractor except in very young children. JOSEPH O'DWYER, Assoc. Ed., *Annual*, '96.]

The writer some six years ago, with the assistance and co-operation of Charles Truax & Co., of Chicago, devised a set of instruments differing in many particulars from those of O'Dwyer, the dominant idea, however, being the same. The aim was to insure more perfect disinfection. The obturator has no joint and is

not screwed upon the instrument, but is a plain band of steel solidly attached to the introducer. Moreover, the instru-

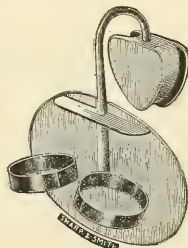


Fig. 19.

ment, which consists of only two plain pieces of metal, can be easily separated. There are no crevices in which septic matter can be concealed. The tubes are

the same as in the O'Dwyer set. The gag is constructed so as to insure unlocking of the blades for purposes of disinfection. The extractor (Fig. 26) is also so constructed that the three parts of which

ducer. It has at its distal extremity two serrated beaks about two inches long. They are opened by a pressure with the thumb upon a lever, and are automatically held open by a ratchet arrangement, while pressure with the index finger

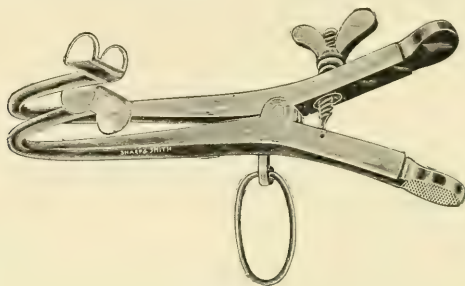


Fig. 20.

it is made can easily be separated for the same purpose. These instruments are simple, uncomplicated, and efficient.

Improved intubator for the relief of laryngeal stenosis. The tubes are corrugated and act as a self-retaining device, being much less easily ejected; they are made of vulcanized Para rubber, the best and purest obtainable. The length is the same as O'Dwyer's. They are made

upon the lower end of this ratchet-bar relieves it and closes the beaks. By firm pressure the beaks hold the tube immovably. The tubes themselves are also slightly modified, the upper opening being funnel-shaped to facilitate the introduction of the beaks when the tube is in the larynx, and the lower end being cut off at an angle of forty-five degrees, inclining from right to left. This facilitates the passage of the tube between

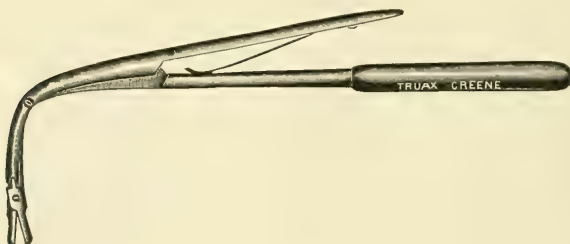


Fig. 21.

large in the centre. The introducer is so constructed that the lumen of the tube is never occluded. L. Fischer (Med. Record, June 20, '97).

Instrument personally designed combines the offices of extractor and intro-

the vocal cords. Max Thorner (Cincinnati Lancet-Clinic, Feb. 19, '98).

Comparative Value of Intubation.—

The weight of evidence, nowadays, as compared to tracheotomy is in favor of

intubation as a life-saving operation. Out of 543 cases in which I have performed intubation, all in private practice, I obtained 215 recoveries, or 39.79 per cent. In my last 143 cases, there were 76 recoveries, or 53.14 per cent. In the 40 cases (fully reported at the Denver meeting of the American Medical Association, Section of Pediatrics) in which antitoxin was employed in conjunction with in-

of the operation when aided by the use of antitoxin.

FIRST HUNDRED CASES.

Age.	No. Cases.	Recoveries.	Percentage.
Under 1 year	5	1	20.00
1 year	13	2	15.38
2 years	22	4	18.18
3 years	17	2	17.76

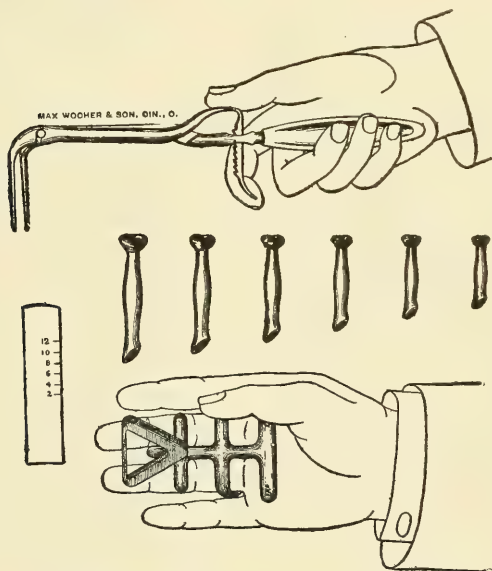


Fig. 22.—Thorner's combined introducer and extractor.

tubation, there were 38 recoveries, or 95 per cent. Such a record I am convinced has never been reached by a single operator with tracheotomy in private practice.

The following tables of my cases well illustrate the success that followed increasingly the gradual development of the operation, and the wonderful results

4 years	15	7	46.66
5 years	9	3	33.33
6 years	5	2	40.00
7 years	8	2	25.00
8 years	4	3	75.00
9 years	1	1	100.00
10 years	1	0	00.00
	<hr/>	<hr/>	<hr/>
	100	27	27.00

SECOND ONE HUNDRED CASES.

Age.	No. Cases.	Re- coveries.	Per- centage.
1 year	17	5	29.81
2 years.....	15	2	13.33
3 years.....	14	4	28.56
4 years.....	22	7	31.81
5 years.....	9	6	66.66
6 years.....	8	3	37.50
7 years.....	6	4	66.66
8 years.....	1	1	100.00
9 years.....	3	2	66.66
10 years.....	1	0	00.00
12 years.....	2	0	00.00
13 years.....	1	0	00.00
14 years.....	1	0	00.00
	100	34	34.00

THIRD ONE HUNDRED CASES.

Age.	No. Cases.	Re- coveries.	Per- centage.
Under 1 year	5	2	40.00
1 year	11	2	18.18
2 years....	13	5	38.46
3 years....	19	11	57.72
4 years....	22	9	40.90
5 years....	10	5	50.00
6 years....	7	1	14.28
7 years....	6	3	50.00
8 years....	2	0	00.00
9 years....	2	0	00.00
10 years....	1	1	100.00
20 years....	1	0	00.00
43 years....	1	1	100.00
	100	40	40.00

FOURTH ONE HUNDRED CASES.

Age.	No. Cases.	Re- coveries.	Per- centage.
Under 1 year	2	1	50.00
1 year	11	3	27.27
2 years....	20	7	35.00
3 years....	19	10	52.63

4 years....	20	7	35.00
5 years....	11	4	36.36
6 years....	5	1	20.00
7 years....	5	1	20.00
8 years....	3	2	66.66
10 years....	2	1	50.00
11 years....	1	1	100.00
60 years....	1	0	00.00
	100	38	38.00

THE LAST ONE HUNDRED AND FORTY-THREE CASES.

Age.	No. Cases.	Re- coveries.	Per- centage.
Under 1 year	2	0	00.00
1 year	19	7	36.84
2 years....	28	22	78.57
3 years....	35	17	48.57
4 years....	20	11	55.00
5 years....	9	4	44.44
6 years....	9	8	88.88
7 years....	8	2	25.00
8 years....	5	4	80.00
9 years....	1	0	00.00
10 years....	2	1	50.00
12 years....	2	0	00.00
13 years....	1	0	00.00
17 years....	1	0	00.00
36 years....	1	0	00.00
	143	76	53.14

THE LAST FORTY CASES.

Age.	No. Cases.	Re- coveries.	Per- centage.
1 year	5	4	80.00
2 years.....	12	12	100.00
3 years.....	6	6	100.00
4 years.....	6	5	83.33
5 years.....	2	2	100.00
6 years.....	7	7	100.00
7 years.....	1	1	100.00
8 years.....	1	1	100.00
	40	38	95.00

Two thousand three hundred and sixty-eight cases of intubation collected from the reports of 166 operators, with 647, or 27.3 per cent., recoveries. Dillon Brown (*N. Y. Med. Jour.*, Mar. 9, '89).

Two thousand four hundred and seventeen tracheotomies performed for croup, with 586 recoveries, or 24.2 per cent., and 5546 intubations, with 1691 recoveries, or 30.5 per cent. George McNaughton and William Maddern (*Brooklyn Med. Jour.*, Aug., '93).

Collective investigation on intubation in Germany gives an aggregate of 1445 cases intubated for the relief of croup, with 553 recoveries, or 38 per cent. Ranke (*Münchener med. Woch.*, No. 44, '93).

The results in tracheotomy are: in 15,995 cases, 4816 recoveries, or 30.18 per cent.; in intubation, 8299 cases, with 2486 recoveries, or 29.97 per cent. In 769 cases of intubation secondary tracheotomy has been practiced 136 times as a last resource, and has given 10 cures. Gillet (*Gaz. des Hôpitaux*, Mar. 5, '94).

Twenty-six cases of intubation for croup in a country practice, with a mortality of 30 per cent. Abarnon (*Thèse de Paris*; *Ped.*, May 15, '98).

I fully believe that when antitoxin is given early and properly and energetically employed in full doses and repeated that the disease is at once cut short and that no further progress occurs. Again, I am fully convinced that if a patient dies after intubation from bronchial obstruction due to the presence of diphtheritic exudation, that the remedy has either been used late, the extension having taken place before its administration, or that it has been used with a hesitating hand and in insufficient dosage or that the preparation has been of uncertain strength. The normal prognosis in diphtheritic or membranous croup, is so fatal that hesitation in the use of antitoxin is almost criminal. A full dose of 2000 units should be given to a child and half the strength for infants, repeat-

ing or even doubling the dose in twelve or sixteen hours. It should be given in full doses and be repeated once, twice, or thrice, if necessary.

O'Dwyer has stated that acute non-traumatic stenosis of the larynx in children that endangers life by suffocation is, with rare exceptions, diphtheria. This disease, if unrelieved by mechanical means, proves fatal in about 90 per cent. of the cases, and, with all the aid that medicine and surgery can afford, it still continues to be, with few exceptions, the most fatal of all acute diseases. In contrast to this statement it may now be said that as a result of the early and free use of antitoxin, aided by properly performed intubation, death from this disease should rarely occur.

Intralaryngeal insufflation is a most valuable auxiliary in the emergencies of surgical practice. Whenever the respiratory function is compromised and imperiled by acute surgical atelectasis, an apparatus for artificial respiration suggested which consists of a modified O'Dwyer tube and a new graduated air-pump. The instrument is described in detail, and while the opportunity has not been afforded the author to apply this pump on a living subject, its practical working capacity has been fully demonstrated on the cadaver and dog. Rudolph Matas (*Amer. Med.*, Jan. 18, 1902).

F. E. WAXHAM,
Denver.

INTUSSUSCEPTION. See OBSTRUCTION, INTESTINAL.

IODINE, IODOFORM, AND OTHER DERIVATIVES.—Iodine, obtained from the ashes of sea-weeds and from crude Chilean saltpeter, occurs in the form of bluish-black scales. It gives off a characteristic violet vapor and emits an acrid and unpleasant odor when burned. Iodine was discovered by Courtois in 1812

in sea-salt. It is not found in its pure state in Nature, being combined with potassium or sodium in marine plants, which absorb it from their surroundings. Iodine melts at 107°C ., but volatilizes completely at 175°C . It gives off fumes at ordinary temperature. It is but slightly soluble in water (1 part in about 7000), but is very soluble in alcohol and glycerin.

Iodine imparts a dark-yellow or brown color to all substances over which it is lightly applied, but wherever starch is present the coloring is blue. This property to color starch blue is so marked that it serves as the basis of various tests that make it possible to detect iodine in about four hundred and fifty thousand times its weight of water. Its detection in urine is greatly facilitated by allowing a portion of the liquid to evaporate; the addition of a few drops of nitric acid serves to insure the liberation of any iodine that may be present in combination with other elements.

In estimating the iodides in the urine, the decomposition of these salts by chlorine may be employed. Two and one-half drachms of urine are taken, and an equal quantity of hydrochloric acid and 2 or 3 drops of chlorine-water added. A brown color appears, which is changed to blue by the addition of starch-water. For quantitative estimation the urine is evaporated and charred and the char burned off. The residue is taken up with water acidulated with nitric acid, and nitrate of silver added to excess. The precipitate consists of the chloride and iodide of silver. It is collected, dried, and weighed, and then subjected to chloridization, as above. The difference in weight, due to the transformation of the iodide into the chloride, is the basis for calculation of the quantity of iodine in the primary precipitate. Jolles (Zeit. f. anal. Chemie, B. 30, p. 288, '91).

Attention called to a source of failure in recognizing the presence of iodine in

an ammoniacal urine, which must be of considerable importance. When one adds strong, fuming nitric acid to the urine containing an iodide the iodine is freed, and is usually recognized by solution with a purplish color in chloroform. If, however, the urine contains ammoniacal compounds this reaction may be quite different. The iodine reacts upon the ammonia salts, and is formed into nitric iodide and hydriodic acid ($\text{NH}_3 + 6\text{I} = \text{NI}_3 + 3\text{HI}$). This substance is very unstable, and in decomposing forms iodic acid, hydriodic acid, and nitrogen ($4\text{NI}_3 + 3\text{H}_2\text{O} = 6\text{HI} + 3\text{I}_2\text{O} + 4\text{N}$). Thus, one may entirely fail to get the characteristic chloroform solution. To such a urine caustic potash should be added to replace the ammonia, in order that this mistake be avoided. Gillet (Annales de la Polyclinique, Oct., '91).

Attention again called to the use of iodine as a test for bile. The reagent is a dilute tincture of iodine, of a bright mahogany color. The test is made by allowing the iodine to run into an inclined test-tube containing the suspected fluid, and in the presence of bile forms a grass-green ring at the point of contact. Rosin (Wiener klin. Woch., No. 11, '98).

Preparations and Doses.—Iodine is not employed in solid form. The preparations generally utilized are the following:—

Tincture of iodine is a 7-per-cent. solution in alcohol. It is not used internally because the iodine is precipitated by the gastric juices. It should, therefore, only be employed for topical applications. A decolorized tincture has been made and used, but it contains no iodine, and is worthless.

Compound solution of iodine (Lugol's solution). This is, by far, the best preparation of iodine for internal use. It contains 5 per cent. of iodine and 10 per cent. of iodide of potassium. Dose, 3 to 15 drops, largely diluted.

Ointment of iodine contains 4 per cent. of iodine, 1 per cent. of iodide of potas-

sium, 2 per cent. of water, and 93 per cent. of benzoated lard.

Potassium iodide, white colorless crystals, slightly bitter saline taste, soluble in water and alcohol. Dose, 5 to 30 grains, but well diluted.

Potassium iodide should *not* be administered soon after a meal, since the iodine will form the inert iodide of starch.

Sodium iodide; same properties as the iodide.

Iodide of sodium preferred to that of potassium on the ground that it is less apt to produce nausea, loss of appetite, and emaciation. It also contains more iodine in the proportion of 10 to 9. R. Cory (Brit. Med. Jour., May 26, '88).

Sodium iodide is preferable to the potassium salt. The tolerance is not caused by the iodine, but by the potassium. The usual minimum dose prescribed is 1.25 cubic centimeters (20 grains) of a saturated solution in a glassful of water three times daily, one-half hour after meals. This dose can be increased .3 cubic centimetres (5 grains) daily up to 24.64 cubic centimetres (400 grains) three times daily if desired, or to the point of iodism. During the administration of the heroic doses the patient is instructed to drink copiously of water. The author believes it essential to give large doses of iodides to obtain the best results, as they are very rapidly eliminated from the system. Brunson (American Medicine, May 14, 1904).

The only substitute for iodide of potassium which has given satisfaction is the iodide of rubidium. While possessing the same advantages as the iodide, it is not as unpleasant to the taste and is better tolerated. The dose and its indications in therapeutics are the same.

The new product—iodide of rubidium—is better tolerated than iodide of potassium. Neisser (Ther. Monats., No. 5, '94).

Solution of arsenic and mercuric iodide (Donovan's solution) contains 1 per

cent. each of the arsenic iodide and the mercuric iodide. Dose, 1 to 8 drops, well diluted.

Ammonium iodide; colorless plates, having a bitter taste. Similar to iodide of potassium. Dose, 3 to 5 grains, well diluted.

Strontium iodide; colorless plates; bitter saline taste; become yellow on exposure to the air. Soluble in hot and cold water. Similar to the iodide, but thought to be less irritating to the intestinal tract. Dose, 5 to 10 grains well diluted.

Iodomuth—used for dressing wounds, discharging surfaces, etc.—is clean, effective, and practical, as well as scientific. Iodomuth is a new preparation of bismuth, containing 25 per cent. of iodine. It is reddish brown in color, thoroughly antiseptic, and sedative, without the unpleasant odor of iodoform and like preparations; it is superior to boric acid, in that it is more hæmostatic. W. Harpur Sloan (Phila. Med. Jour., May 11, 1901).

Iodipin, a combination of pure iodine and oil of sesame, passes through the stomach unchanged, and is partly split up by the pancreatic fluid and bile and partly absorbed as chemically-intact iodine in the intestine. It is thus partly stored up as iodipin, and the contained iodine is slowly liberated. It may be used either by subcutaneous injections or by the mouth. Iodipin is said to act as powerfully as, and even more so than, potassium iodide, and to produce no symptoms of iodism. It is especially used in bronchial asthma, fibrous phthisis with asthma, and syphilis of the lungs. Zirkelbach found that, when iodide of potassium has produced iodism, iodipin could be used without danger. Lewitt (Deutsche med. Woch., May 16, 1901).

New iodine preparation, idio-nucleoid, an organic combination, the iodine being combined with nuclein. It occurs as a reddish-brown granular powder and contains 9½ per cent. of iodine. This powder is insoluble in acids, alcohol,

ether, chloroform, and is slowly soluble in alkaline fluids. The cases chiefly selected for the trial were those which had exhibited an iodine idiosyncrasy. In one of these cases 30 grains of potassium iodide three times a day caused a severe iodism, so that the drug had to be discontinued. Subsequently 10 grains of iodo-nucleoid was substituted, the dose being increased to 60 grains a day, but without symptoms of iodism. In all the writer has given it in fifty-one cases with no untoward effects, except the occasional appearance of a slight iodine acne. It is believed that the good effect of the iodine medication is due to the retention of the iodine in an organic combination in the system. W. L. Baum (Chicago Medical Recorder, July 15, 1903).

Physiological Action.—When applied to the skin, iodine turns it a yellowish brown. At first it acts as a slight irritant, but when the applications are too frequently repeated, or the preparation is too concentrated, the superficial structures may undergo a process of active inflammation, which usually subsides, however, when the applications are stopped.

When taken internally, iodine, as well as its salts, is eliminated by the kidneys, and tends to irritate these organs when large doses are administered. At first the flow of urine is increased; later on it is decreased, and the proportion of urea may also be greatly diminished. It frequently causes albuminuria, and nephritis has been ascribed to the influence of the iodides, but the evidence that nephritis was not already present before the administration of the remedy has not been made clear in the cases reported. Notwithstanding Haig's view to the contrary, increase of the products of metabolism, urea, etc., in the urine, has been noted by many observers, and it is probable that contracted kidney, a condition now known to be present in most cases, in part accounts for Dr. Haig's views.

Sée and other observers have claimed that iodine accumulates in the system, and that its elimination occurred irregularly. Küss ascribes to this fact the majority of the deleterious symptoms often attending its use.

Iodine, according to Küss, accelerates the cardiac action in persons in whom the circulation is quiet. Haig, as shown, connects the arterial tension with the amount of uric acid circulating in the blood. The majority of authors recognize the existence of dilatation of the capillaries and smaller blood-vessels, but the reports upon this point are exceedingly contradictory. A general retrospect of the views advanced would tend to show that the quantity administered has much to do with the problem, large doses tending to increase arterial pressure.

Iodized water and solutions of iodine or iodides do not affect the blood-pressure when injected into the veins. Solutions of iodide of potassium, introduced in the same manner, act like potassium and increase it. In larger doses they provoke a fall in blood-pressure. Iodide of sodium proves less dangerous in this respect, and in large doses produces a temporary increase of pressure, followed by a period of gradual diminution. The effects of the iodides in the treatment of arteriosclerosis may possibly be explained by their beneficial influence on general nutrition. Prevost and Binet (London Med. Recorder, Sept., '90).

Iodide of potassium dilates the vessels somewhat more than does digitaline, and increases considerably the peripheral circulation, as well as the circulation of the arteries which supply nourishment to the heart. G. Sée (*La Méd. Moderne*, July 2, '91).

Study of the effects of iodide of potassium upon the blood of fifteen patients and four healthy persons before and after taking iodide of potassium. The effects of the medicament in doses of from 15 to 30 grains a day on non-syphilitic

patients and on healthy persons is, during the first two or three days of its administration, to increase the number of young corpuscles and to diminish the number of overmature white corpuscles in the blood, and, at the same time, to increase the number of those breaking up. As to the total number of corpuscles per cubic millimetre, the effect of the iodide appears to be to cause an increase, but a slight one. Administered to syphilitic patients, the iodide produces an increase in the number of overmature elements and a decrease of the immature white corpuscles and those which are breaking up. T. V. Ishumin (Inaug. Dissert., No. 120, '94).

The iodides given in relatively small doses, three or four times daily, and continued for many months and even years, have the power to retard, modify, and improve subacute and chronic inflammatory processes in connective tissue of parenchymatous organs like the kidneys, the liver, the lungs, and particularly so the sclerotic disease of the arterial vessels. It appears that this salutary effect is brought about by direct inhibition of the proliferation of the connective tissue, as well as by subsequent induction of disintegration and fatty metamorphosis of infiltrated corpuscular elements and the removal of the same. It is reasonable to hold that the drug manifests and develops its activity through the lymph-channels and spaces of the affected organs by direct action upon the irritating substances, by stimulating the vasomotor nerves and increasing the functional activity of the parts. The favorable influence of the iodides can be clinically demonstrated, and is more decided in arterial sclerosis than in similar disease of parenchymatous organs, and will show itself frequently, whether the underlying cause is gout, alcoholism, or syphilis. Leonard Weber (The Post-graduate, Oct., '98).

Case of a man, aged 59, who was admitted to hospital suffering from a swelling in the sternal region. As this was evidently gummatous, potassium iodide, and liq. hydrarg. perchlor. were given; after three doses (amounting to 15 grains of the one and 2 drachms of

the other) the medicine had to be discontinued on account of violent vomiting. This having been subdued by lavage, the iodide was recommended a week later. After taking 20 grains he was suddenly seized with severe pains in the extremities. An extensive purpuric eruption rapidly developed, he became collapsed, and in thirty hours was dead. There was slight vomiting. Post mortem, recent ulcers—becoming gangrenous in places—were found in the stomach and small intestines, particularly the duodenum. The author considers that purpura is due to direct injury to the endothelial cells of the blood vessels, impairing their function, and that in the case under notice it might have been due to the elaboration of a combined poison by the joint action of potassium iodide and a factor constructed directly or indirectly by tissue metabolism. He further holds that all cases of purpura can be ascribed to similar poisons in which the factor potassium iodide is replaced by toxins, some of bacterial origin, the other factor being now more, now less, evident. J. B. Cleland (Brit. Med. Jour., July 11, 1903).

Iodism.—Coryza and profuse discharge from the mucous membrane of the upper respiratory tract, pytalism, and an acneiform eruption generally starting over the shoulder-blades constitute, in the majority of cases, the initiatory symptoms indicating iodism. This may appear after a few doses have been taken in persons who possess a distinct susceptibility to the drug, but in the majority it is not until the dose administered has become quite great. In some persons small doses are more likely to cause iodism than large ones. In some patients the active manifestations are much more grave, nausea, diarrhoea, and marked frontal headache being complained of. The skin-eruption may assume many phases, from a simple acne or dermatitis to eruptions simulating those of variola, varioloid, purpura, eczema, etc.

In order that iodism can arise, (1) nitrites must circulate in the blood; (2) the reaction on the mucous membranes must not be alkaline. On this hypothesis there are three indications for treatment: 1. To attempt to combine the free iodine again. 2. To remove the nitrous acid at the moment of its liberation from the nitrites. 3. To prevent the formation of free nitrous acid. 4. No way of accomplishing this purpose is found. 5. Nitrous acid is destroyed by sulphanilic acid, with the formation of diazo-benzol-sulpho-nitrate, as asserted by Ehrlich. The writer tried $1\frac{1}{2}$ drachms of sulphanilic acid and $\frac{3}{4}$ to 1 drachm of sodium carbonate in 5 fluid-ounces, immediately after the appearance of iodism, and obtained the happiest results in a number of cases, thus supporting Ehrlich's views. Two and one-half to 3 drachms of sodium bicarbonate are given within twenty-four hours in two doses. It was found that when potassium iodide and bicarbonate of soda were given simultaneously, no symptoms of iodism appeared, but iodism promptly manifested itself on the withdrawal of the bicarbonate of soda. Rohmann and Malachowski (*Ther. Monats.*, July, '89).

Iodism is due to the accumulation in the body of large quantities of alkaline iodides. The mucous membranes secrete this substance, and its sudden appearance in the body results in a catarrhal condition of the mucous surfaces. The prevention of iodism lies in the administration of iodine salts in mucilaginous substances, as these prevent their rapid distribution in the system; in dividing the daily dose into many small doses; in administering the drug by enema; in substituting other drugs, such as iodide proteids and iodide fats for the alkaline iodine salts; in the use of iodipine when iodine is indicated subcutaneously. F. Lesse (*Deut. med. Wochen.*, Nov. 12, 1903).

When any of the preparations of iodine are used internally, the respiratory tract should be watched lest dyspnoea occur from œdema of the glottis. This is especially the case when syphilis is present.

The likelihood of this untoward feature is decreased by the copious use of drinking-water while the iodides are being taken.

Series of nine cases collected from the literature which show that in rare cases the internal use of iodide of potassium may suddenly produce such intense œdema of the glottis as to render necessary the immediate performance of tracheotomy. In some cases the œdema is so severe as to produce death, although in others it may disappear as rapidly as it occurs. It was shown that the untoward consequence may occur soon after the injection of the drug, and even after small doses. Four cases presented the œdema on the first day, 1 under a dose of 15 grains, 2 under $7\frac{1}{2}$ grains, and the fourth under as small a dose as 3 grains. Three cases showed the symptoms on the second and the eighth on the sixth day, after doses varying from 30 to 195 grains. It was observed, where œdema occurred, that all other symptoms of iodism were absent, and, further, that age and sex had no influence; that it appeared in otherwise perfectly healthy persons, and that after the disappearance of the œdema persistence in the use of the drug produced no unfavorable after-effects; so that iodism is not a permanent symptom. Œdema of the glottis, fatal in a few minutes if not relieved promptly, may supervene on the early administration of the drug, and that the longer the salt is used, the less danger is there of œdema. A. Groenouw (*Ther. Monats.*, Mar., '90).

Case in which, some days after the omission of the iodide of potassium, which had been given for the treatment of syphilis, there occurred laryngeal œdema with stridor. Eight days later the affection disappeared. P. Heymann (*Jour. of Laryngology*, Feb., '92).

Atrophy of the mammae and testicles has been observed when iodine or its salts had been administered for a long time. Mental disorders, insomnia, hypochondriasis, and hysteria have also been noted. Peripheral nervous disorders—such as neuralgia, neuritis, etc.—have

occasionally been produced. The neuralgia is sufficiently severe at times to necessitate the discontinuance of the remedy. Küss states that the menstrual flow may assume an hæmorrhagic form. Rapid emaciation sometimes results from the continued use of iodine or its preparations.

Iodism is less likely to occur in children than in adults. The chances of iodism are decreased when the patient is careful to gently dilute the salt taken.

The absorptive power of potassium iodide and sodium salicylate diminishes as the age of the patient advances, and this is probably due to the different condition of the vascular system existing at different ages. K. L. Jatzüta (Inaug. Dissert., No. 12, '90).

Attention drawn to the fact that iodism is of exceptional occurrence in children, and, the younger the patient, the less is the liability to this accident. J. Comby (La Méd. Mod., July 10, '95).

Prevention of Iodism.—Probably the best remedy we have is Fowler's solution; it in no way seems to interfere with the action of the iodine preparations. From 2 to 4 drops given during meals in water, the iodides being administered after meals in considerable water, most satisfactorily serves the purpose. The carbonate of ammonia, the bromides, and belladonna have been extolled by some writers, but these agents are liable to give rise to unpleasant symptoms when administered during a prolonged period. The bromides are especially objectionable.

The remedy need not be discontinued when iodism is produced, in the majority of cases. By reducing the dose the untoward effects may be sufficiently mitigated. When the iodides are completely withdrawn, they sometimes cause a renewal of the iodism even more severe than the first attack.

In the treatment of iodism the use of extract of belladonna, 1 to 2 grains, daily recommended in order to avoid the naso-pharyngeal symptoms. Sodium bicarbonate in dose from 90 to 180 grains seems to benefit the general manifestations of the poisoning. Sulphanilic acid in from 40 to 60 grains *per diem* will fix the nitrous acid, which, remaining in a free state, would decompose the iodide. In addition, a diet poor in nitrates—as milk, bread, and meats—should be insisted upon. For the eruptions, antiseptic of the skin is important; baths and lotions of lime permanganate (1 to 25,000) are useful. The best method, however, is the preventive. One should always commence with a small dose (7 grains), and gradually increase the amount. Large quantities of milk and even diuretics are prescribed with the drug. Hæmorrhage should be treated by ergotine, salivation by potassium chlorate. Œdema of the glottis may necessitate tracheotomy. Briquet (La Sem. Méd., No. 18, p. 137, '96).

Iodism is due wholly to the elimination of iodine by the various mucosæ of the body. The decomposition of the iodine salts which precedes this elimination is due to the presence of nitrites in the blood. By using naphthionic acid this decomposition is prevented. Capitain (La Méd. Mod., June 4, '98).

In some cases small doses of iodine produce iodism, while in others large doses may be taken without effect. The dosage should be determined by the effect produced upon the diseased process. Many patients appear to have a maximum iodine point, and, if more than this is given, iodism occurs. The simultaneous administration of arsenic and belladonna often prevents the appearance of iodism. Lewis S. Somers (Med. News, Sept. 29, 1900).

Belladonna is the best drug to relieve the coryza-like effects of potassium iodide when 5 drops of the tincture are given with each dose of the iodide. Montgomery (Med. Age, Oct. 25, 1900).

To prevent the occurrence of iodism and hydrargyrisms, which temporarily hinder treatment, the writer recommends the employment of alkaline ben-

zoates, preferably benzoate of ammonium. It is best given in cachets containing 0.25 gramme (about 3 to 4 grains), of which 4 to 8 may be given per day. The author suggests that the antiseptic action of the salt and its eliminative action may be the causes of the beneficial effects it produces. Bretonneau (*Annales de Thér. Dermat. et de Syphil.*, t. ii, No. 7, 1902).

Poisoning by Iodine.—A small dose of iodine produces no uneasiness apart from a metallic taste which is sometimes persistent. When large doses are taken, the symptoms of iodism appear; and a marked sensation of burning may be experienced in the gastric region and along the œsophagus. Great thirst is complained of. There is increased sexual excitement. Nausea, vomiting, cramps, and purging may be induced. There may be tinnitus, shooting pains, and increased flow of urine. When a poisonous dose is taken, these symptoms are aggravated; there is great pallor and later on cyanosis, anuria, and the pulse is thready, and there is marked prostration. The vomited matter is tinged yellow and the urine, if any can be obtained, dark brown; there is increasing nervous excitement, spasm, and finally a comatose state.

The application of iodine over large surfaces has also induced toxic symptoms; its injection into morbid growths likewise.

The quantity of iodine capable of causing toxic symptoms varies greatly. While large doses ($2\frac{1}{2}$ drachms) have been taken without producing marked effect, one scruple has induced violent symptoms. Its absorption is extremely rapid; O'Shaughnessy found iodine in the urine four minutes after its injection. The toxic effects are transmissible to a nursing infant.

Two cases related in which absorption of the tincture of iodine applied to the

vaginal mucous membrane occurred. In the first case symptoms of intoxication appeared in six minutes. In the second case the application of iodine to the cervical cavity, in the course of treatment for an affection of the genital organs, resulted in the diminution in size of a goitre. Repin (*Revue Méd. de la Suisse Rom.*, July 20, '93).

Case of acute and fatal iodine poisoning in a man, aged 70 years, who suffered from arteriosclerosis, chronic interstitial nephritis, and hypertrophy of the left ventricle, and who ten years before had contracted severe syphilis. On December 3d and 4th he was given 15 grains of sodium iodide. This was followed by iodism and iodine acne. On the same day appeared subconjunctival petechiæ, swelling of the mucous membrane of the nose and throat, dyspnoea, and swelling of both testicles. On December 7th the nares ulcerated; the urine contained albumin, hyaline and granular casts. No iodine was found in the urine. On December 10th there occurred inflammatory infiltrations in the skin of the face and trunk; a phagedænic ulcer formed on the lower lip; the skin of the trunk and extremities was covered with small abscesses and vesicles containing turbid, yellowish-green serum. This condition was followed by double hydrothorax, pulmonary œdema, and death. At the necropsy the following changes were found: Pemphigus of the skin and mucous membrane of the œsophagus, chronic interstitial nephritis, hypertrophy and dilatation of the heart, sero-fibrinous pericarditis, double hydrothorax, œdema of brain and lungs, chronic perisplenitis, and commencing cirrhosis of the liver. The explanation of the case is that, owing to the diseased state of the kidneys, the iodine was not eliminated, and the amount retained was sufficient to cause death in such a broken-down subject. Franz (*Brit. Med. Jour.*; *Wiener klin. Woch.*, No. 23, '99).

Treatment of Iodine Poisoning.—The usual antidote employed is starch, but white of egg or milk are, according to Trousseau, indicated by the greater affinity of proteid substances for iodine. The

stomach should be emptied soon after the use of either of these substances to reduce the intensity of the subsequent effects. The other symptoms present should be treated on general principles, the tendency to collapse being combated by appropriate stimulants injected per rectum and hypodermically.

Therapeutics.—Iodine and its preparations are extensively used, but in syphilis, one of its salts, the iodide of potassium, may be said to be invaluable, especially in the tertiary form and all the manifestations of the disease in which the various organs are involved. As the indications are thoroughly reviewed under each special heading, including SYPHILIS, more than a reference here would be superfluous. The best plan is to administer in increasing doses, beginning with 10 grains, three times a day, gradually increasing the dose by 1 grain a day until the limit of toleration is reached. Many patients reach 1 drachm and beyond, especially if plenty of pure spring-water is drunk simultaneously.

The indications for the administration of iodine are clearly given by Comby. Iodine is considered a specific in hereditary syphilis and in the tardy symptoms of acquired syphilis. In the initial and secondary stages mercury alone is sufficient; in the tertiary stage iodide of potash is indicated. An exception is made in the hereditary syphilis of the newborn, in whom the exhibition of iodide of potash should be begun early. Not only should positively syphilitic children receive iodine, but all who have suspicious symptoms, as coryza, exostoses, etc., or a cachexia which appears without apparent cause, or when the child is prematurely born, or the mother has had frequent abortions. In convulsions, pseudoparalysis, meningeal symptoms, etc., it is also indicated. The adminis-

tration of iodine in children with gummy tumors, disease of bone, perforation of the soft palate and hæmoglobinuria is, of course, clearly indicated. Finally, in all parasymphilitic symptoms (Fournier), as hydrocephalus, cerebral tumors, partial epilepsy, etc., iodine is valuable.

In metallic poisoning iodide of potassium, by forming soluble salts with mercury and lead, causes these metals to be eliminated from the system. In painter's colic, therefore, wrist-drop, and other manifestations of lead poisoning and mercurial poisoning it serves an inestimable purpose. At times, however, either of these metals may lie practically dormant in the tissues, and suddenly find themselves brought into activity by the iodide of potassium, signs of severe poisoning following. When, therefore, there is good reason for the belief that considerable lead or mercury is lying in the system, the treatment should be started with small doses; this can then be very gradually increased—considerable water should be drunk to assist the process of elimination and reduce, by lowering as much as possible the specific gravity of the urine, lesions of the kidney.

It is generally accepted that sodium iodide is preferable to potassium iodide in all diseases of the respiratory tract and for certain rheumatic pains. The potassium salt is badly tolerated in many instances of hepatic disease, but is undeniably good in these cases. Where the patients do not tolerate iodide of potassium well, the employment of iodide of sodium first prepares them for the potassium salt.

DISEASES OF THE RESPIRATORY TRACT.—In phthisis iodine has been recommended, but it is doubtful whether it is productive of much benefit. Inhalations of its vapor have been extolled as an excellent stimulant to the mucous

membrane. The danger of hæmoptysis is always present, however, and is likely to be increased by stimulation of this kind.

In the early stages the local application of iodine over the threatened or diseased area is of great service. The front and back of the chest may be painted on alternate days, thus keeping the patient under the influence of the remedy. The application of cotton-wadding over the painted areas tends to increase the efficacy of the treatment.

In pleuritic effusions, pleurodynia, circumscribed pneumonia and bronchitis, the same proceeding is sometimes remarkably effective, especially if the region is kept warm.

Iodide of potassium and sodium can be employed with advantage in the chronic forms of croupous pneumonia and the pneumonia following or complicating influenza, beginning on or about the twelfth day of the disease. In doses of 23 to 30 grains per day for adults, and proportionately smaller ones in children. G. Zielinski (Univ. Med. Jour., July, '93).

Iodide of potassium is particularly valuable in asthma, especially when combined with belladonna. An efficacious preparation is the following:—

R Iodide of potassium, 2 drachms.

Water, enough to dissolve the iodide,

Then add:—

Tincture of belladonna, 2 drachms.

Syrup of orange-peel, enough to make 3 ounces.

It is an error to suppose that potassium salts are especially poisonous to the heart. The sodium salt has no advantage, and is just as liable to produce iodism. The iodides are useful (1) for dyspnoea of a secondary nature, (2) in troubles of intrapulmonary circulation, (3) for reducing the volume of aneurisms, (4) for reducing the size of a tumor and thus relieving the symptoms of

compression. G. Sée (Le Bull. Méd., Aug. 15, '88).

In the peribronchial enlargements so frequently encountered in scrofulous children the exhibition of iodine is often attended by considerable benefit, especially when combined with local applications. The syrup of the iodide of iron, given in 5-drop doses, three times daily and gradually increased, is especially valuable in this connection.

In naso-pharyngeal affections weak solutions of iodine in glycerin are of great value, when gently applied night and morning with a camel's-hair pencil or a pledget of cotton. Lacrymal disorders are also benefited by the same applications; when iodine is simultaneously painted over the thyroid cartilage, the effect is enhanced.

Good results obtained in the treatment of atrophic naso-pharyngeal affections from the application of pure tincture of iodine. After cleansing and using a 5-per-cent. solution of cocaine the iodine is lightly applied with a small brush of absorbent cotton. The applications are made at first every second day; later on, once a week. Hunter Mackenzie (Brit. Med. Jour., Apr. 27, '95).

SCROFULOSIS.—In scrofulous affections—so called—iodine fulfills a useful purpose. Lugol, who did so much to show the merits of iodine in this class of cases, is said to have obtained a large proportion of recoveries by means of the solution bearing his name as far back as 1828. Bazin recommended it especially in early manifestations before the cervical glands were too greatly enlarged, and when ulceration was not near at hand. All glandular enlargements, joint-enlargements, and osseous disorders are beneficially influenced by iodine used internally and externally simultaneously.

Intravenous injection in cases of syphilis and scrofulo-tuberculosis of infants recommended. The solution used contains 1 gramme (15 grains) of iodine

and 3 grammes (45 grains) of potassium iodide in 100 grammes ($3\frac{1}{3}$ ounces) of distilled water. The maximum dose is 5 cubic centimetres ($1\frac{1}{4}$ fluidrachms). Spolverini (Bull. Méd., May 8, 1901).

RHEUMATISM.—In this disease iodide of potassium is a valuable remedy, but only in the subacute or muscular form, *i.e.*, when the acute or inflammatory symptoms have passed. To give it during the inflammatory stage is worse than useless. It may be used, however, in rheumatic pains devoid of inflammatory manifestations, lumbago, sciatica. Its efficacy is vastly increased in all forms of rheumatism by the addition of colchicum. The following formula may be recommended:—

R Iodide of potassium, 2 drachms.

Enough water to dissolve this.

Then add:—

Tinct. of colchicum - root, 3 drachms.

Syrup of orange-peel, enough to make 3 ounces.

M. Sig.: One teaspoonful to be taken every three hours.

The local application of iodine over the painful area, this being then covered with cotton wadding, greatly hastens the curative process.

GOITRE.—As shown in the section on GOITRE, iodine is of great value in this disease, and is now second only to thyroid extract when utilized in appropriate cases, namely: those suffering from the true hypertrophic variety. When the goitre is cystic, or the gland is but the seat of a neoplasm, benign or malignant, iodine is obviously useless.

Iodine has also been used with advantage in exophthalmic goitre.

Use of iodine by cataphoresis in an old case of goitre where subjective symptoms were very severe,—10 to 15 drops on cotton in cup-shaped electrode daily for three weeks,—intermission of three weeks

—treatment persisted in for three weeks more.

The gland was reduced to about one-fifth the size it was when the treatment was begun, and, in spite of all further use of the remedy, remained stationary; but all of the subjective symptoms were gone, and the woman left in excellent health. Two other cases of chronic goitre have been treated in the same way, and with the same results. In 4 cases of recent hypertrophy of the thyroid gland in young women, the enlargement rapidly disappeared under the use of this measure. McGuire (Virginia Med. Month. Review, Aug., '91).

Case of simple goitre in which, after failure of the iodine treatment, the use of glycerol extract of the thyroid gland resulted in complete cure. Sabrazès (Berliner klin. Woch., Feb. 3, '96).

SKIN DISORDERS.—Tincture of iodine applied over inflamed surfaces sometimes overcomes inflammatory disorders of the skin. Erysipelas, thus treated early, may be aborted; late in the disease, however, the results are not so satisfactory. It should be applied once daily. The pitting of small-pox may be greatly counteracted by touching each pustule with iodine. In acne, psoriasis, pityriasis, and ringworm it is also used advantageously. In actinomycosis (*g. v.*) iodide of potassium is the most efficacious remedy.

The writer has cured, with iodide of potassium, two cases of actinomycosis in man, one a tumor occupying all the submaxillary region, and on the region of the cæcum, considered at first as a perityphlitis. The doses were $7\frac{1}{4}$ to 31 grains per day in the first case, and $15\frac{1}{2}$ grains per day in the second case, for sixteen days. V. Herson (Wiener med. Presse, Jan. 8, '93).

SURGICAL USES.—Iodine possesses marked antiseptic properties, as first shown by Liebig. Fibrin immersed in iodized water does not undergo putrefaction. Pus treated with iodine does not have the fœtid odor after several days which can, without the iodine, be

detected in a few hours when exposed to the air. The addition of a few drops of iodine to foetid pus causes the odor to disappear.

Irrigations of iodine-water, of the strength of 1 to 10,000, used for the treatment of wounds, this to be followed by the application of either pure aristol or a mixture of 1 part of aristol to 4 of boric acid. Under such treatment luxuriant and profusely-bleeding granulations quickly returned to their normal appearance. Tikon von Popoff (*Brit. Med. Jour., Sup., Aug. 1, '91*).

Iodine trichloride is recommended for the treatment of tuberculous and suppurative processes. It may also be employed for cancerous surfaces and venereal sores, in 5- to 20-per-cent. solution in equal parts of water, ether, and glycerin. Solutions stronger than 5 per cent. cause smarting in ordinary wounds. The author states that gauze sterilized by boiling and dried, after being immersed in a 1- to 10-per-cent. aqueous solution, retains iodine trichloride for an indefinite time. Belfield (*Med. Record, July 16, '92*).

Good results obtained in the treatment of two cases of vesical tuberculosis and one of tubercular epididymitis by a 5-per-cent. aqueous solution of iodine trichloride. Belfield (*Jour. Cut. and Genito-Urin. Dis., Aug., '92*).

A litre of spring-water may be sterilized in a few minutes by 4 drops of tincture of iodine; even less will cause the annihilation of pathogenic microbes. Meillère (*La Tribune Méd., Dec. 26, '94*).

Excellent results obtained in the treatment of tubercular joint-disease, tubercular adenitis, and even in pulmonary tuberculosis, by the hypodermic injection of iodine in the following combination: from 1 to 5 parts of iodine, 10 parts of the potassium iodide, and 100 parts of distilled water; 1 cubic centimetre of this liquid being injected each day, using first the 1-per-cent. solution and gradually advancing to the 5-per-cent. solution. The injections of iodine should be continued for at least six months. Durante (*Med. Week, '94, ii, p. 274*).

Iodine injected into sinuses greatly

aids in their closure. De Forest Willard (*Annals of Surgery, Dec., '96*).

EXTERNAL APPLICATION.—The tincture of iodine is extensively used as a counter-irritant. As such it may be said to have become a household remedy, and to be more or less beneficial in almost all ailments characterized by pain, except when abrasions are present. When applied over the skin, the latter becomes yellow and future applications gradually cause it to become brown. Burning and itching are then experienced; the applications had better be stopped until the distressing symptoms disappear. As already stated, poisoning can occur when too great an area is covered. As a rule, the surface covered should not exceed that represented by the two hands. When applied over the chest, its effects may be sustained by painting the front of the thorax one day and the back the next. A piece of cotton wadding placed over the surfaces thus treated enhances the efficacy of the iodine. In ophthalmology it is frequently employed in the treatment of trachoma.

Eymonnet has prepared a paper moistened with solution of potassium iodide and dried, and another paper prepared with potassium iodide and tartaric acid, moistened and dried. If these papers be kept separate and dry they will keep indefinitely. If a rubefacient be required, the papers are moistened and brought in contact with the skin. Iodine is liberated and causes a reddening of the skin, followed by desquamation. R. Lépine (*La Semaine Méd., Jan. 30, '89*).

The following method of employing iodine topically is of service. A piece of gutta-percha tissue is taken and given three or more coatings of tincture of iodine; it is then dried and applied in the selected locality, with the iodine coating turned toward the skin, and secured with a roller bandage. In this way the good results of the topical application of iodine may be secured with-

out smarting. M. Iversen (*Med. News*, Apr. 20, '95).

Iodine applied by painting is absorbed by the skin. This absorption, very small when the painted part is exposed to the air, becomes much more active when it is hermetically covered. The superficial alteration of the epidermis produced by the tincture of iodine, provided it does not go on to destruction of the corneous layer, appears to be an obstacle rather than an aid to absorption. Under the most favorable conditions the absorption is too irregular to make the paintings of iodine useful in general iodine medication. Iodoform and ethyl-iodide are absorbed by the healthy skin, the latter in sufficient quantity to be useful, if needful, for a general iodine treatment. Linossier and Lannois (*Bull. Gén. de Théor.*, 9e liv., p. 385, '97).

Seventy-eight cases out of 100 cured with nascent iodine generated by administering potassium iodide internally, and, when the iodine begins to be eliminated in the lacrymal secretions, painting the upturned lid with oxygenated water. R. Roselli (*Semaine Méd.*, July 20, '98).

HYPODERMIC INJECTION.—Hypodermic injections of iodine are extremely painful and give rise to considerable irritation. Iodide of potassium can be used hypodermically, however, and is not productive of so much pain if lukewarm water be employed.

Iodine combined with iodide of potassium dissolved in sterilized water injected into the veins of animals was perfectly painless and caused no appreciable disturbance. No thrombosis, either instantaneous or consecutive, showed itself. All animals submitted to these experiments gained in weight. Blood withdrawn after the operation showed no morbid tendency to coagulate. L. M. Spolvereni (*Il Policlinico*, May 1, 1900).

RECTAL INJECTIONS.—Rectal injections of iodine solutions have been used in colitis or in diseases in which this condition is the most prominent factor, dysentery and chronic diarrhoea, the ulcer-

ative processes present being favorably influenced. One drachm of Lugol's solution in 1 pint of lukewarm water may be used after carefully cleansing the bowel by means of an enema. If pain is caused by the mixture employed, 1 drachm of iodide of potassium may be substituted for Lugol's solution, or a small quantity of extract of opium may be added. Two pints should be injected night and morning, the strength of the solution being increased if need be.

Study of the absorption of iodide of potassium from the rectum of healthy and sick persons; conclusions: 1. In eight healthy persons iodine could be discovered in the saliva in from five to nine minutes, the average being seven minutes. 2. In five patients with lesions about the rectum or in its neighborhood (cancer of the rectum, parametritis, retro-uterine hæmatocele, etc.) the absorption was retarded, the time varying between nine and fifteen minutes. 3. The same retardation occurred in seven patients with remote affections (acute nephritis, malignant disease of the stomach, cardiac organic disease, etc.), the time averaging about fourteen minutes. 4. When in the form of solution the iodide was absorbed by the rectal mucous membrane more rapidly than when in that of suppository, the difference amounting to several minutes. The iodide was introduced into the rectum either in aqueous solution—2 1/2 drachms to 1 1/2 ounces—or in suppositories containing the same amount of the salt. Baczkiewicz (*Pamiętnik Towarzystwa Lekarskiego Warszawskiego*, '92).

The absorption of potassium iodide, when introduced into the rectum, is as rapid as when given by the stomach. If it be desired to obtain a still more rapid absorption, the solution may be heated from 95° to 98.6° F. The time during which elimination goes on is practically the same by either method of administration. With the weak solutions ordinarily given, elimination is complete in from twenty-four to thirty hours. Concentrated solutions are excreted more slowly,—that is, in from thirty-eight to

forty hours. Calantoni (*Riforma Medica*, Apr. 26, '92).

Iodide of potassium detected in the saliva in about fifteen minutes after its administration by the mouth, and in ten minutes after its introduction through the rectum. Lemanski and Main (*Le Bull. Méd.*, Jan. 29, '93).

The iodide of potassium, ingested by the rectum, is eliminated by the stomach, this elimination beginning from one-fourth to one-half hour before that occurring by the kidneys. P. Kandidoff (*Wratsch*, Apr., '93).

PARENCHYMATOUS INJECTIONS.—These are still considerably employed in hydrocele after evacuation of the fluid. The iodine is supposed to excite local inflammation and obliteration of the cavity. Hydatid cysts can also be treated advantageously in the same manner, a few drops of the tincture injected in the cavity being sufficient. In empyema the removal of the liquid by aspiration and the injection of a weak solution (6 grains of iodine and iodide of potassium to the pint, according to H. C. Wood) may be used to wash out the pleura every day. If no untoward symptoms are observed, the strength of the solution can be increased. This solution may be used in washing out abscesses of all kinds. In cystic goitre parenchymatous injections have also proved curative (see GOITRE).

Iodoform.

This precious agent was introduced by Sérullas in 1822, but was first used in practice by Bouchardat in 1836, then by Glover in 1837. Rhigini, in 1853, brought to light its great value as an antiseptic and disinfectant. Iodoform is obtained by the action of various alcohols or proteid compounds upon iodine (CHI_3), and occurs as small yellow crystals, having a penetrating persistent saffron-like odor, which adheres to every object with which the drug comes in contact. This peculiar odor is one of the

greatest drawbacks of iodoform and has greatly contributed to limit its employment. Patients are rendered obnoxious to their friends, while the physician can with difficulty rid himself of the offensiveness incurred by its use as a remedy.

Among the methods recommended to deodorize iodoform without altering its therapeutic properties are the following:—

Oil of sassafras, 4 drops to the ounce of iodoform (Dodsley).

A few drops of any of the aromatic oils: almonds, musk, tar, etc. (Charteris).

Oil of *evodia fraxinifolia*, 2 drops to the ounce of iodoform (Helbing).

One part of menthol and 1 part of oil of lavender to 20 parts of iodoform (Cantrelli).

One part of menthol to 20 parts of iodoform (Caubrelle).

One or 2 parts of creolin to 100 of iodoform (von Jaksch).

To remove the odor from the hands or the clothes of the surgeon the readiest means is to use ether or chloroform (Washburn).

Washing the hands with orange-flower water is sufficient to dispel the odor of iodoform after handling that substance. Constan (*Lyon Méd.*, Nov. 28, '97).

Vinegar applied freely to the hands after they have been cleansed with soap and water will effectually remove the odor of iodoform. Ricketts (*Treatment*, Feb. 22, 1900).

Preparations and Dose.—In the treatment of wounds the powder is generally used, and with dangerous freedom by many surgeons. Thirty grains should be the limit for any single application of the drug, and a smaller quantity should be employed as a rule.

Internally, the powder may be given in doses ranging from 1 to 5 grains to adults.

Iodoform is insoluble in water, but

soluble in ether, alcohol, and the fixed volatile oils. Ethylic alcohol saturated with camphor can dissolve eight times as much iodoform as pure alcohol.

Solutions of iodoform should be kept in red or green glass bottles, in order to prevent the liberation of iodine from them under the influence of light.

When glycerin or oil is used 5- or 10-per-cent. solution is generally preferred. The former is preferred for the treatment of serous cavities.

The iodoform-oil is of more value to the average physician than the iodoform-glycerin mixture, because of the ease with which it can be prepared and sterilized. The sterilization of the latter, however, may be done as follows: The glycerin should be heated by itself, and after it has been allowed to cool the proper amount of iodoform should be added. The advantages of this method are that the iodoform is not decomposed by the heat. Stubenrauch (*Centralb. f. Chir.*, Dec. 10, '92).

At a temperature of 64.5° F. 67 parts of alcohol at 95 per cent. are required to dissolve 1 part of iodoform, while at the boiling-point 9 parts at 95 per cent. are sufficient to dissolve 1 part; of ether, 5.6 parts are required to dissolve 1 part of iodoform. G. Vulpus (*Pharm. Centralh. f. Deutschland*, '93).

Saturated solutions of iodoform in ether become, as the point of saturation is reached, very unstable, and under the influence of the slightest causes they are decomposed suddenly, a reddish color resembling that of tincture of iodine resulting. The decomposition is rendered less rapid if the solutions are less concentrated. In saturated ethereal solutions it may be retarded by the addition of alcohol and by keeping them protected from sunlight.

The ointment of iodoform (U. S. P.) contains 10 per cent. of the drug.

Physiological Action.—Iodoform containing about 29 parts of pure iodine in

30, the carbon and hydrogen with which it is associated render the iodine non-irritant, either when taken by the mouth or applied topically. It is markedly anæsthetic when locally applied, owing to a benumbing influence upon the peripheral nerves. Defecation may follow the use of iodoform suppositories, and not be felt by the patient.

Iodoform tends to decrease the energy of cardiac contractions and reduces the number of pulsations. When toxic doses are administered the contractions become gradually weaker and the heart ceases its work in diastole. The action begins upon the nerve-trunks, then extends to the muscles. There is alteration of the blood-corpuscles, according to Floucaud.

Rummo has shown that the elimination of iodoform is extremely slow, though it begins soon after its ingestion. It leaves the organism by all the secretions and iodine may still be found in the urine three days after the iodoform is employed.

In dogs poisoned by iodoform Koriandère found inflammation of the glomeruli of the kidney and fatty infiltration of the liver, principally around the periphery of the lobules. In chronic cases he found, besides these changes, extreme emaciation, general anæmia, purulent bronchitis, rhinitis, conjunctivitis, and accumulation of pigment in the Malpighian bodies.

Untoward Effects of Iodoform.—Recently Hubener has shown that no essential difference in the toxic effects of finely powdered or coarse crystals of iodoform can be established by experimental research. Still, powdered iodoform is more quickly absorbed and diffused by the lymph-channels than the coarser form.

Experiments in animals have shown that, when used in the peritoneal cavity,

iodoform has a distinct tendency to produce an inflammatory process, resulting in an excessive formation of adhesions. Consequently its use under such conditions should be restricted, and the sterile gauze employed whenever feasible.

Crystals of iodoform have been found to a large extent to become converted by the action of the tissues into minute vesicle-like granules. Prior to its ultimate breaking up into its chemical components, it undergoes a change into complicated iodine compounds, whose exact nature as yet remain unknown.

Many of the untoward results observed during the use of iodoform are due to impurities. In order to test the purity of iodoform, a practical plan is to shake a portion up with distilled water, filter, and treat the liquid with alcoholized solution of nitrate of silver. If in twenty-four hours no precipitate occurs, or only a slight grayish cloudiness, the iodoform may be regarded as pure.

When iodoform is employed, the use of mercurials should be avoided. Its use along with carbolic acid is also fraught with danger.

Mercurous iodide poisoning resulting from the use of iodoform as a surgical dressing and calomel internally. Simpson (*Amer. Jour. of Obstetrics*, Apr., '98).

The local symptoms due to iodoform are generally insignificant erythematous erosions, erysipelas, or simulated phlegmon, especially affecting the finer portions of the skin, as the face, eyelids, scrotum, etc. The conjunctiva, however, appears to be tolerant of the drug, and the eruptions are rarely observed in children. The local lesions are almost always due to the use of the powder and gauze. General symptoms may occur without any preceding local symptoms, the point of entrance being the stomach, lungs, or skin. Injections of iodoform-ether are rarely followed by accidents, though cer-

tain wounds predispose to such, especially those involving fatty tissue.

The clinical signs are a sudden rise of temperature (102.2° to 104° F.) and the appearance, on the same day or the following day, of an eruption, often of the scarlatiniform or erythematous type. Internal symptoms may exist at the same time or alone, such as dislike for food, burning sensation in the epigastrium, vomiting, and nausea. All these phenomena may be sufficiently severe to cause death. (Chéron.)

What may be termed "surgical iodoformism" is sometimes met with. After a longer or shorter period of complete toleration the wound, while secreting no pus, is surrounded by an inflammatory area with development at its circumference of inflammatory vesicles (iodoformic herpes). Petechiæ appear near the wound or at a distance in patches or groups. The wound stagnates and inflames, but does not heal. A generalized pruritus along the collateral nerves of the fingers follows, succeeded by diffuse phlyctenulæ. Areolar or pseudo-erysipelatos lymphangitis appears in the affected limb. If the use of iodoform is persisted in lymphangitis progresses, the tongue becomes coated, and the patient is agitated and sleepless. A phlegmonous condition with general symptoms develops, and necrosis may threaten the patient with loss of limb or life. Tussau (*Semaine Méd.*, Nov., '96).

Case of a woman in good health, who died of iodoform poisoning. On the left leg was a small varicose ulcer which had been dressed with iodoform powder. After this treatment tumefaction set in and the leg became red and painful, and at the end of eight days there was a generalized eruption. *Editorial* (*Revue Méd. de la Suisse Rom.*, p. 431, '96).

Case of a woman who sustained burns of the thighs and abdomen to which iodoform dressings were applied. After three weeks without other signs of general poisoning a progressive amblyopia appeared, accompanied by atrophy of the temporal half of both disks. Terson

(Société de Biol.; Annales d'Ocul., Nov., '97).

The toxic effects of iodoform are well illustrated in the three subdivisions of symptoms proposed by McLean:—

1. Cutaneous irritation: Eruptions of the skin in erythematous or eczematous form, associated with the pruritus of urticaria.

2. Cerebral disturbances: Headache often very marked; delirium more or less active; melancholia, hallucinations; the pupils occasionally dilated, but more often contracted and motionless; the pulse decidedly accelerated, running early up to 135 to 150 per minute; quality rather small and wiry; rapid increase of temperature.

3. Syncopal or asthenic form of poisoning: Patient overcome with dizziness, mental confusion, great lethargy; weak, rapid pulse; some paralysis of the sphincters, death coming sometimes suddenly by heart-failure.

The quantity thought capable of causing death has been estimated at 1 drachm in a case witnessed by Langenstein, but it is probable that in the majority of cases this dose would not prove fatal. Czerny has reported a death after $1\frac{1}{2}$ drachms had been taken. It is probable, however, that the susceptibility of the patient bears considerable influence upon the results. This susceptibility may, in turn, be to a degree under the influence of the varying conditions of the patient's resistance, etc. The smallest dose thought to have caused death (1 drachm) should therefore be considered as likely to give rise to dangerous symptoms in any case, although larger doses have been taken with impunity.

Case of a woman who took 2 drachms of iodoform at one dose, with no evil results. The only symptoms manifested were severe headache, griping pains in the abdomen, and purging. The taste in

the mouth and the odor of the drug in the breath of the patient remained for several days. H. W. Frauenthal (N. Y. Med. Jour., Jan. 11, '91).

Treatment of Iodoform Poisoning.—

The active symptoms of iodoform poisoning may sometimes be prevented by timely measures when the preliminary signs appear. It is important to know, however, whether iodoform intoxication is really present. This may be ascertained, according to Sasse, by the following means:—

A test is made of the urine to note the quantity of iodine which is eliminated by it. A small pinch of powdered calomel is placed upon a saucer, and then a few drops of the urine to be examined are dropped upon it; a mixture of the urine and calomel is then made with a glass rod. If the urine contains a notable amount of iodine there is produced a well-marked yellow discoloration, which should indicate that the iodoform is being absorbed in sufficient quantity to produce danger.

The immediate removal of the drug from the surface in cases of surgical-dressing intoxication is of obvious importance. This can easily be done by means of a warm solution of starch, which takes up all the free iodine that is present. Alcohol and hot water may be used instead. The local conditions are then treated symptomatically, a few doses of bromide of potassium being given internally to assist in counteracting the poisonous effects.

When a large dose has been taken internally, the stomach should be emptied and 20 grains of bromide of potassium given in a half-tumblerful of water. Four 10-grain doses should then follow every hour. This salt is thought to be a positive antidote, owing to its power as a solvent of chloroform.

Twenty-per-cent. solution of bicarbonate of potassium administered to a case of iodoform poisoning. The best results followed, the medicine seeming to act as a direct antidote. Behring (*Ther. Gaz.*, Mar., '88).

Bromide of potash acts as an antidote to iodoform not only as a neutral potash salt, but also by virtue of its specific bromide action. Joseph Samter (*Berl. klin. Woch.*, Apr. 15, '89).

The antidotal property of potassium bromide explained by stating that it excels all other salts in regard to its solvent property for iodoform. Samter and Retzlaff (*Wiener med. Blatter*, July 11, '89).

Therapeutics.—The use of iodoform in the treatment of wounds and ulcerative processes has become so general that a list of its indications would serve no useful purpose. The manner in which iodoform produces its effects, however, will prove of practical interest.

In the powdered state, iodoform has been shown by de Ruyter, Kronacher, Baumgarten, Heyn, Drowsing, and others to possess but little, if any, value as an antiseptic in laboratory experiments, notwithstanding its undoubted value in practice. It was found, when mixed with rapidly infective bacteria, in no way to reduce the development of disease in animals. Even the bacillus tuberculosis, though previously mixed with powdered iodoform, when introduced into guinea-pigs produced tuberculosis precisely as if no antiseptic had been employed. Again, it was found to have no direct effect in preventing the development of staphylococcus pyogenes, the coccus pneumoniae, or other well-known organisms.

Far different were the results, however, when the solutions in which decomposition of the iodoform has already begun were utilized. Organic fluids, blood, serum, in which micro-organisms are undergoing the process of development possessing the property of decomposing

iodoform, its antiseptic powers, though unexplained, are nevertheless accounted for. In other words, the properties of iodoform are due to its decomposition, and the activity displayed is proportionate to the energy of the chemico-physical process involved. Whether the decomposition is due, as is believed by many, to ptomaines, local stimulation, or other effects is not fully established.

If wounds inflicted on dogs or guinea-pigs are infected with staphylococci or streptococci and are treated with iodoform, they heal more quickly and secrete less than those which are not thus treated. Iodoform lessens the virulence of these micro-organisms; neutralizes or destroys the microbe toxins, but not completely; it does not lessen the amœboid motion or the phagocytosis of the white blood-corpuscles. Lomry (*Archiv f. klin. Chir.*, B. 53, H. 4, '96).

Iodoform is not used in surgery as it was a few years ago, although it may safely be said that, all advantages considered, no drug has shown itself entitled to its place. Its unpleasant odor has alienated the majority of those who have abandoned it. Its present *status* among surgeons at large is well represented by the varying views expressed at a recent meeting of a surgical society:—

Use of iodoform is not increasing, but, on the contrary, it is decreasing. Acetanilid gauze has largely superseded it. T. G. Morton.

The writer uses iodoform very little. Thymol-diiodide is cheaper and better for fresh wounds. Thymol and acetanilid are sufficient for nearly all cases. De Forest Willard.

Not used by writer as much as formerly, but it is a very good remedy in certain cases, as in bone-cavities and especially in cases of abscess about the rectum, where no packing can take its place. Used in the same way in operations about the mouth iodoform packing remains sweet longer than any other packing. H. R. Wharton.

The employment of iodoform in per-

sonal practice limited to its use as a gauze for packing and drainage, especially where dryness and antiseptics are required for prolonged periods; as an injection in emulsion with glycerin for tubercular joints or abscesses; and, occasionally, in the shape of a 5-grain suppository in tubercular affections of the rectum. Thomas S. K. Morton.

There are two classes of cases in which powders are used antiseptically, one in which the drying element is desired and the other in which antiseptics is to be obtained. In the latter case there is not anything to be compared to iodoform. Iodoform is the most reliable agent to stop suppuration when actual contact can be secured. G. G. Davis.

The writer has not been able to find anything which would take the place of iodoform in securing cleanliness in a moist cavity. George Erety Shoemaker.

Routine use of iodoform to the exclusion of other dressings equally as good and free from the many objections protested against. W. G. Porter.

Iodoform is still a valuable drug. It is used nearly as much to-day as ten years ago. R. H. Harte.

The rational use of iodoform is as much indicated to-day as it ever was. It is useful in chancroids, and nothing can take its place. W. Joseph Hearn. (*Annals of Surgery*, May, '98.)

Summary of 84 replies from prominent surgeons to the question: "Would surgery suffer if iodoform were abolished?" The effect, according to 37, would probably be negative; 47 considered that surgery would suffer. Of the latter, 27 thought the detriment would be general, 12 limited its use to surgical tuberculosis, and 8 to its use in gauze and specific cases. Personal belief that in five years the general answer will be: "Not in the least." E. C. Brush (*Jour. of Amer. Med. Assoc.*, Dec. 16, '99).

SURGICAL TUBERCULOSIS.—It is in the treatment of tubercular conditions amenable to surgical interference that iodoform finds its main application as a curative agent.

In the treatment of joint-tuberculosis our associate editor, Dr. L. S. Freeman,

recommends, with many other able surgeons, a 10-per-cent. suspension in olive-oil. His directions may be summarized as follows: Absolute cleanliness should be observed. The iodoform should be soaked for twenty-four hours in a 1 to 1000 solution of bichloride of mercury, which is stirred occasionally with a glass rod to make sure that the solution touches every particle of the powder. It is then filtered, employing a filter-paper through which has been poured a quantity of boiling water. The remains of the bichloride are then washed away with sterilized water. The iodoform is removed from the filter with a surgically-clean knife, and rubbed up with the oil in a sterilized mortar, about 4 per cent. going into solution and 6 per cent. remaining in suspension. The oil is best rendered germ-free by keeping it at the boiling-point for about half an hour. If the mixture is kept in a dark place in a sterilized bottle stopped with germ-free cotton, it will not deteriorate for a long time.

The injections should be made both into the joint-cavity and into the surrounding infected tissues. It is best to but partially withdraw the needle and insert it in a new place rather than to make a number of punctures in the skin.

If tubercular pus is present, it should first be withdrawn.

One syringeful of a 10-per-cent. suspension of iodoform is an average dose. It is well to begin with a moderate quantity and watch carefully for symptoms of iodoform poisoning—which, however, seldom appear.

In general, the injections can be repeated every two or three days over a period of several weeks, and then continued at intervals of a week or two.

The following formula given for an iodoform emulsion for injection into tuberculous fistulæ: Iodoform, 3 parts;

starch, 1 part; mix until a fine powder is obtained and add glycerin, 20 parts; water, 12 parts; heat gradually, stirring the mixture constantly, up to 271.4° F. The emulsion of 10 per cent. thus obtained is very stable, while that ordinarily prepared by triturating iodoform in glycerin and heating is very unstable, the iodoform soon precipitating. R. H. Lucy (Brit. Med. Jour., Jan. 7, '93).

Twenty-one tuberculous abscesses, with 16 complete cures, treated by routine of iodoform in sterilized oil or glycerol, a 10-per-cent. solution. Abscesses in tubercular arthritis, accompanied with grave suppuration, were most rebellious to the iodoform injections. Four cases had symptoms of poisoning, 2 of which had attacks of acute nephritis. Wieland (Deut. Zeit. f. Chir., xli, 4, 5).

In 39 cases of tuberculosis involving the wrist, treated by iodoform injections after the manner originated by Bruns, 24 were permanently cured, while, with 15 more, other measures had to be resorted to.

Iodoform was used in the form of an olive-oil emulsion of a strength of 10 to 20 per cent., and in the granulating form of the malady from 30 to 120 minims were injected; but where abscesses had been emptied, from 3 to 9 drachms were employed. Briegel (Beit. Z. klin. Chir., B. 20, '98).

In tubercular laryngitis the local use of iodoform has also been followed by excellent results. The ulcerative surfaces being carefully cleared of their muco-purulent discharges by a detergent spray, the ether solution of iodoform recommended by Elsberg (1 part of ether and 4 parts, crystallized, of iodoform, shaken in a red bottle) is then topically applied. This should be repeated frequently. In hæmorrhagic disorders complicating tuberculous processes it is also of value. In tubercular aural diseases its use is as satisfactory as it is elsewhere.

Seven cases of tuberculous laryngitis cured by general treatment and lactic acid and iodoform locally. Bernengrun (Arch. Laryn., ii, p. 2; Quart. Med. Jour., Jan., '96).

Two cases of primary tuberculosis of the larynx cured by spraying with a solution of iodoform in ether following a spray of cocaine. To be efficient the iodoform treatment must be adopted before ulceration takes place. Newman (Jour. of Laryn., Mar., '96).

Excellent results in two cases of early phthisical hæmoptysis from the use of iodoform in eucalyptolized oil, beginning with a daily dose of $\frac{3}{4}$ grain. The hæmoptysis ceased by the third day. Gallot (Gaz. Hebdom. de Méd., Sept. 1, '98).

INTERNAL USE.—The employment of iodoform by the mouth has never received much support. In pulmonary tuberculosis it has been tried by many clinicians, but the results have generally been disappointing, notwithstanding Gosselin's experiments showing that guinea-pigs, when saturated with iodoform, could stand with impunity inoculations with tubercular material. Its use in other diseases has been barren of results when tried by several observers. Even in syphilis its effects have not, as a rule, been satisfactory.

INUNCTIONS.—Recently, Flick, of Philadelphia, after an experience of eight years, has recommended the use of iodoform by inunctions in the treatment of pulmonary tuberculosis. Europhen may be used instead; in fact, the last preparation is preferred by the author. The mixture is composed as follows: Iodoform or europhen, 1 drachm; olei rosæ, 2 minims; olei anisi, 1 drachm; olei olivæ, 2 $\frac{1}{2}$ ounces. About a tablespoonful of the solution is rubbed into the skin of the inside of the thigh and into the armpits at night.

By means of this treatment, chiefly among the out-patients, he comes to the conclusion (1) that incipient cases can always be cured; (2) that cases advanced to the breaking-down stage may be improved very much, and sometimes may be cured; (3) that the treatment ought

to be continued even after the acute symptoms have disappeared, and should be maintained until perfect health is re-established. Flick gives creasote and tonics while using the inunction treatment. A combination of the two methods—viz., the creasote and tonic with the inunction treatment—gives better results than either separately.

SUBSTITUTES FOR IODOFORM.—Quite a large number of substances have been recommended as possessed of the therapeutic properties of iodoform, without presenting its untoward features. The best known of these are the following:—

Airol, a gallate of bismuth and iodine, is a light-grayish-green powder, stable in dry air, but when left in contact with moisture iodine is gradually liberated. It is insoluble in water, alcohol, and ether. *Airol* is astringent and desiccative, as well as being antiseptic.

Antiseptol (iodosulphate of cinchonine) is an odorous brown powder, which has been recommended as a substitute for iodoform. It contains half its weight of iodine, and is soluble in alcohol or chloroform, but is insoluble in water.

Aristol (di-thymol-iodide) is a reddish-brown powder containing 45.8 per cent. of iodine. It is insoluble in water, glycerin, or alcohol, but soluble in ether or oils.

Aristol has been used successfully in various skin affections: psoriasis, eczema, rhinitis, ozæna, and lupus, but has proved unsatisfactory in lichen rubra, soft chancre, and gonorrhœa. *Aristol* has a certain effect on venereal ulcers, but acts very slowly; the only advantage it possesses over iodoform is absence of smell—its activity is inferior. It has been found of service in the first and second stages of pulmonary tuberculosis when no cavities exist. It also lessens cough and night-sweats. Burns and

scalds have been successfully treated with *aristol*, and the application in a powder to the cornea in keratitis and in an ointment in corneal ulcers has given good results. It is of great value in nasal affections; it lessens the discharge, relieves pain, and stops bleeding when used as an insufflation in cancer of the cervix uteri.

Di-iodoform is an ethylene-periodate and consists of carbon, 4.62 parts; and iodine, 95.38 parts. It occurs in yellow crystals, is insoluble in water, slightly soluble in alcohol and ether, but dissolves readily in chloroform, carbon disulphide, benzin, and hot toluene. If kept in the dark it remains practically odorless. The compound is an exceedingly stable one. It is said to be well borne by the stomach and to be much less toxic than iodoform.

Europen (iso-butyl-ortho-cresyl-iodide) occurs as a pale-orange, non-crystalline powder, containing 28 per cent. of iodine.

Europen possesses powerful antiseptic properties, and, being resinous to the touch, it adheres well to mucous membrane and wound-surface, and does not easily cake. It is non-poisonous, and acts only when brought into contact with secreting surfaces, which decompose it and liberate iodine. It is especially useful in dentistry. *Europen* may be used with advantage in all cases where iodoform has been employed.

Iodol (tetra-iodo-pyrrol) contains about twenty-seven parts in thirty. It is obtained by precipitating pyrrol with iodo-iodate of potassium. It is a micro-crystalline, brownish-white powder, having a faint thyme-like smell, and is soluble in water. *Iodol* is said to be non-toxic: a statement which should not be accepted with absolute confidence. Still, that it is much less likely to produce un-

toward symptoms than iodoform is certain.

Iodol may be used in all conditions for which iodoform is indicated. It constitutes an excellent antiseptic for all kinds of ulceration, including those of a specific nature. Iodol has been used with good results in gonorrhoeal affections, hard and soft chancres, and various disorders of mucous membranes, including the conjunctiva. It possesses some anæsthetic action, and acts as an astringent when the discharge is copious.

Iodol-ether is a 10- to 20-per-cent. ethereal solution for injection into fistulous tracts and for sprays. By spraying it upon the gauze with which a wound has been bandaged an excellent iodol gauze is had. (Pharm. Centralh., xxxvii, p. 475, '96).

Iodol used in about eight hundred cases of soft and hard chancre and erosion of the neck of the uterus. In soft chancre a healthy granulation was quickly obtained at the base of the ulcer, while in hard chancre the induration quickly disappeared. An important point in the treatment, and one essential to its success, is that the base of the ulcer should always be carefully cleansed, in order to prevent decomposition of the iodol. Majocchi (Univ. Med. Jour., Feb., '96).

Iodosalicylic and *diiodosalicylic acids* are iodine compounds of salicylic acid in which one and two atoms of hydrogen, respectively, are replaced by iodine. Diiodosalicylic acid contains 20 parts of iodine in 30, iodosalicylic acid 15 in 30. Iodosalicylic acid and diiodosalicylic acid are powerful antiseptics. They possess the combined action of iodine and salicylic acid, and have been successful in the treatment of acute pyarthritic rheumatism where salicylates have failed.

Loretin (meta-iodo-ortho-oxy-chinolin-

ana-sulphonic acid) is a bright crystalline powder, odorless, and similar in appearance to iodoform. It is very slightly soluble in water or alcohol, and insoluble in ether, but forms soluble salts with alkalies, except with lime. Loretin is non-poisonous and unirritating, and has been used with good effect on burns, ulcers, and other wounds.

Losophan (meta-tri-iodo-cresol) contains 24 parts of pure iodine in 30. It is a grayish crystalline powder, soluble in alcohol, chloroform, oils, and fats. Losophan has been found useful in parasitic skin affections, but it is apt to cause irritation.

Soziodol (di-iodo-para-phenolsulphonic acid) is composed of 54 per cent. of iodine, 7 per cent. sulphur, and 20 per cent. phenol. Soziodol has been found useful in the treatment of whooping-cough: 3 grains blown into each nostril once daily. A solution of soziodol-mercury with iodide of sodium has been recommended for intramuscular injection in syphilis. (Brit. Med. Jour., Sept. 18, '97.)

Iodoformogen used as an application to recent wounds. After the bleeding had stopped the wounds were dusted with the powder, then sewn, and a thin layer of the powder applied over all. The wounds were, as a rule, rapidly and very satisfactorily healed. Wounds of 2 centimetres and larger, in which there was considerable tension, were also treated without suturing, in order to see if iodoformogen would be able, on account of its great adhesiveness, to firmly adhere to the margins and heal the wounds. As a rule, excellent results were attained in these cases. Schmidt (Amer. Medico-Surg. Bull., July 25, '98).

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